JUNE 1960

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Electrical South

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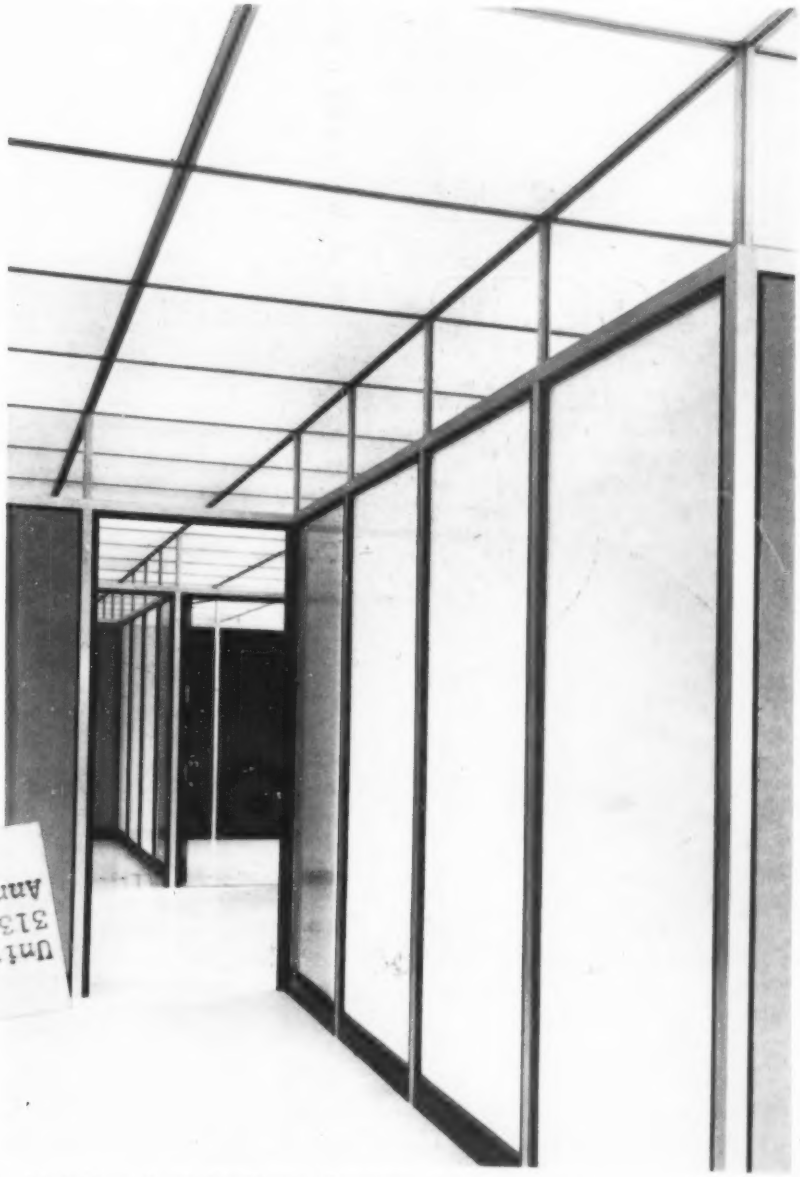

Lighting installations frequently must be coordinated with heating, air conditioning, and acoustical needs.

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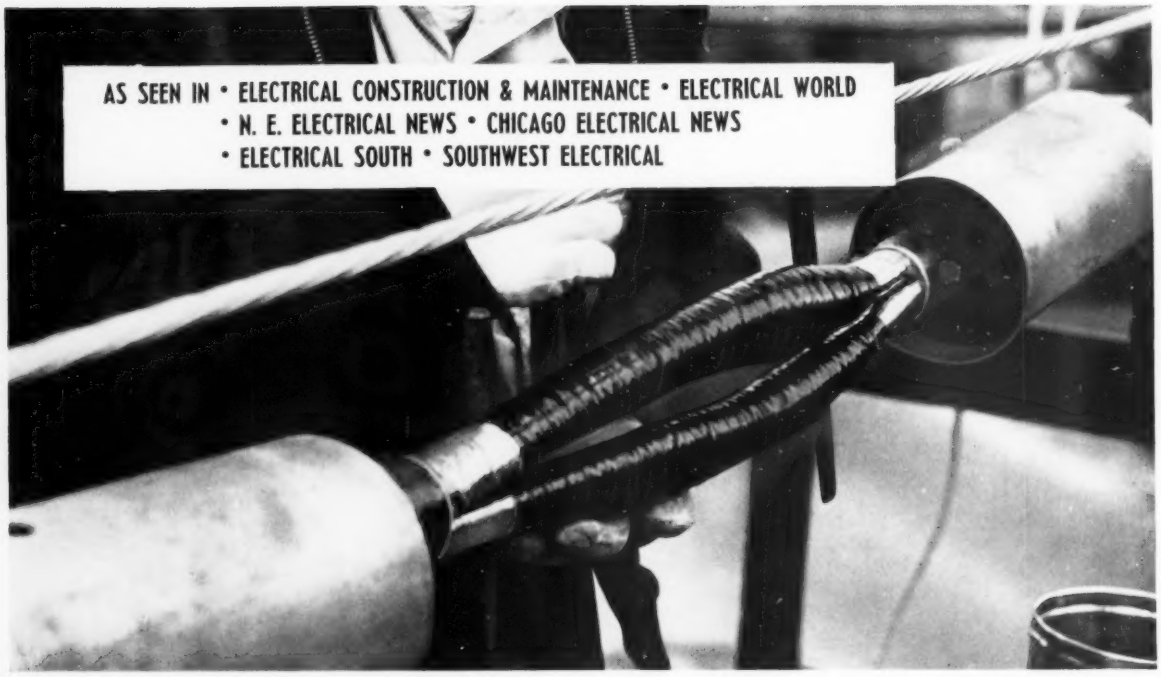
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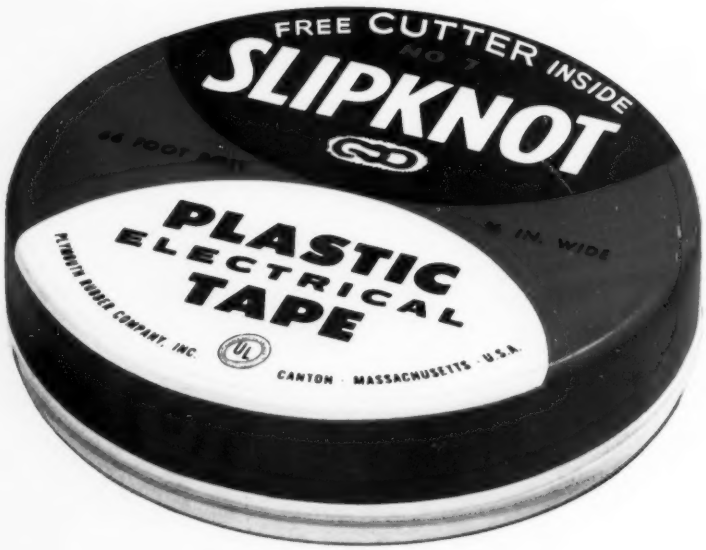

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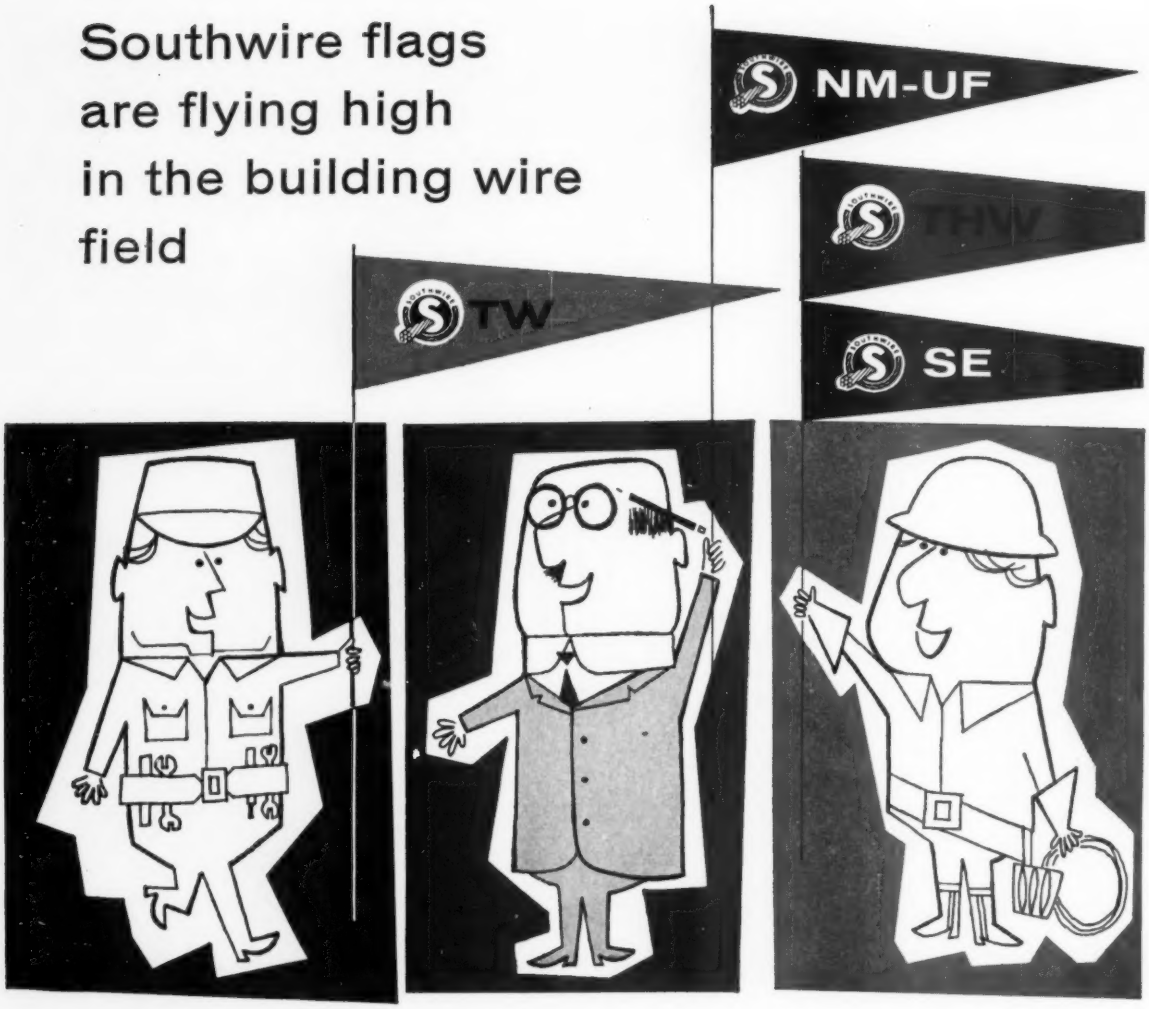

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Economic comment

by J. Whitney Bunting, Ph.D.
Contributing Economics Editor

Erratic economics

It is safe to say that when the economist scans all the facts and statistics that measure economic activity in the United States, he will probably have a mixed reaction in regard to the direction in which we are moving. This is because many indicators show real and well-defined economic advance, whereas others are either static or have declining tendencies.

The best that can be done for present-day study is to weigh each factor carefully, assign to its relative importance as a barometer of economic health, and then total up the pros and cons and arrive at a reasonable conclusion. The difficulty here is that such weighing is being done by human beings, trained in economics and business though they may be, and their decisions are subject to the frailties of bias and incomplete factual data.

This does not mean that conclusions reached are in error or are far afield from reality. It only indicates the fact that varying interpretations of constant facts may produce a variety of prophecies that leave most people more confused that ever. This is the situation in which most of find ourselves today.

One indication of the variety of forecasts is found in present interpretations of stock market trends. For the past few months, the market has rocked along without making any spectacular or steady advances nor, on the other hand, showing any tendency toward a long or serious decline. Since many observers feel that the stock market is a good barometer of business confidence, it might easily be assumed that such a condition pictured widespread doubt about economic advances.

Certainly, one would believe that the investing public was not enthusiastic about the prospects of economic progress that is often portrayed by a rapidly rising stock price situation. If, therefore, the prophecies are based on this one factor, the inevitable conclusion would be that the economic picture was cloudy and that some form of recession was nearby.

Other indications

Just how erroneous such a conclusion would be is proved by recent Department of Commerce figures that shows a strong burst of consumer buying at the retail level in April. Figures released for each of the first three months were better than for the respective month in 1959 yet did not seem to be rising as rapidly as did personal income statistics. Yet the advances did indicate a strong tone in the economy and bolstered predictions for a good, if not banner, year in 1960.

The month of April, however, showed a marked rise in consumer buying, well in davance of the progress made during the first quarter. Thus, this indicator now portrays a most healthy sign for continued economic advance.

Another figure that belies the feeling generated by the lackadaisical stock market is that of business expansion. Normally, plans for business expansion, if significant, generate enthusiasm that pushes stock prices upward and creates a psychological image of good times. In this year, however, the pattern appears to be somewhat different, and all of the business construction and expansion have not created a burst of enthusiasm in the stock market.

It is early yet to say that stock prices will not advance or that they will begin to move upward. There are many other factors that have an effect upon the rise or fall of security prices, but the two mentioned above are strong forces and their impact, if present trends continue, cannot help but be felt.

Political-economic issues

An election year is usually one in which economic forces play secondary roles to those of a more political nature. Often the opposing parties take opposite positions on economic problems and the procedures proposed to overcome them. In this year, there does not appear to be the same sharp contrast between the Republican and Democratic stands on major economic issues.

The fact that the nation has been moving through an unusual period of peace and prosperity, in spite of cold-war rumblings, has left little room for basic economic argument. However, it can be expected that the two major political parties will inject some strong contrasting economic reasoning in the following economic areas:

(1) *Labor-management relations.* The Democratic Party will certainly give effort toward the modification of present laws in this area to the end that organized labor may have greater strength in collective bargaining. This will be a key target for labor political action groups and will be vigorously opposed by business leaders. The Republicans, on the other hand, must champion legislation on the books and work toward "good business" and "good labor." This indicates a pressure for sound business statesmanship in the ranks of both management and labor.

(2) *Inflation.* The stand of the Eisenhower Administration against rising prices has taken much of the force out of any opposition on this issue. There will undoubtedly be some Democratic pressure for "controlled inflationary conditions." Whether this idea can be sold to the electorate because of the President's strong statements in the past is a question, but there will be at least limited action in this area.

(3) *Cheap money.* A greater flow of money into the economic system will be a principal goal of the Democratic Party. This will be incorporated into demands for some inflation, greater housing construction (low and middle in-

(Continued on page 146)

Dr. Bunting is a well-known economist and educator having special knowledge of the South.

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Washington report

By Jack James

Digest of Washington news of special interest to the electrical industry

Upturn in home starts seen for near future

A RISING DEMAND for home building may start about now if the hypothesis of Nathaniel Rogg, economist for the National Association of Homebuilders, works out.

Rogg has observed a "lag correlation" between interest rates that home buyers pay on mortgages and housing starts. An easing in the money supply, he figures, usually precedes by five or six months an upturn in home building. Since interest rates started dropping in January, this implies a rise in home building starting about this time.

Union electricians' rates average $3.90

ELECTRICAL contractors raised pay for their union journeymen electricians an average of 17.8 cents an hour in the 12-month period ending April 1, 1960, the Bureau of Labor Statistics reports.

Average pay rate for union electricians is $3.90 an hour.

The 17.8 cent an hour increase was the greatest in the building trades, according to the Bureau. The Bureau surveyed rates in 100 major cities. Union rates ranged from $2.62½ at Raleigh, N. C. to $4.60 at Trenton, N. J.

These are base hourly rates. They don't include fringe benefits or overtime.

Here are the rates for the 32 Southern cities included in the survey:

Atlanta, Ga., $3.75; Baltimore, Md., $3.75; Birmingham, Ala., $3.65; Charleston, S. C., $3.10; Charleston, W. Va., $3.77½; Charlotte, N. C., $3.00; Chattanooga, Tenn., $3.65; Columbia, S. C., $3.15; also,

Dallas, Texas, $3.50; El Paso, Texas, $3.70; Houston, Texas, $3.80; Jackson, Miss., $3.40; Jacksonville, Fla., $3.65; Knoxville, Tenn., $3.40; Little Rock, Ark., $3.37½; Louisville, Ky., $3.75; Memphis, Tenn., $3.57½; Miami, Fla., $3.65; Mobile, Ala., $3.67½; Montgomery, Ala., $3.10; Nashville, Tenn., $3.42½; also,

New Orleans, $3.77½; Norfolk, Va., $3.55; Oklahoma City, Okla., $3.62½; Raleigh, N. C., $2.62½; Richmond, Va., $3.27½; San Antonio, Texas, $3.50; Savannah, Ga., $3.45; Shreveport, La., $3.60; Tampa, Fla., $3.65; Washington, D. C., $4.20; Wilmington, Del., $4.12½.

Interstate contract signed at Chattanooga

A CONTRACT covering 21 counties in the three states of Tennessee, Alabama, and Georgia has been signed by the National Electrical Contractors Association, at Chattanooga, Tenn., and IBEW Local 175. It's a two year pact. Contractors raised wages 15 cents an hour this year; they will add another 10 cents next year.

Electricians working within a 10-mile radius of Chattanooga courthouse were raised to $3.65 an hour; those outside the 10-mile radius, $3.90 an hour. Contractors contribute one per cent to the IBEW national pension fund and one half of one per cent to the national apprenticeship training fund.

In a separate agreement with IBEW Local 846, the Chattanooga NECA agreed to raise pay 5 per cent to $3.30 an hour for construction on outside utility work. This agreement runs for one year.

Depressed areas bill would help contractors

ELECTRICAL contractors in seven Southern cities might have received some help from the Depressed Areas Bill had President Eisenhower not vetoed it.

The cities are Durham, N. C., Chattanooga, Tenn., Beaumont-Port Arthur, Tex., Roanoke, Va., and Charleston, Huntington-Ashland, and Wheeling, W. Va. These are among 30 major industrial areas in the U. S. that would have qualified for immediate assistance.

The bill would have extended $150,000,000 in low interest loans to help build modern factories, $85,000,000 in loans to improve public facilities, plus help for slum clearance, and projects to retrain jobless workers.

Modern factories are automated. Automation means electronics. For the electrical contractors in these cities with journeymen trained for the most modern wiring jobs, the bill would have meant extra work.

The Depressed Areas Bill, however, is down, but not dead. You will see it come up again in the next session of Congress, if not this.

Tax reform in 1961 could help growth

EVERYBODY talks about the growth of goods and services in America, but it is the people like you, the business men, who do something about it.

You invest money. You buy machines to make products. You pay men for their labor. As long as you keep on buying more machines and hiring more men each year, the amount of goods and services you produce grows too.

Right now this amount of goods and services is increasing at the rate of about 3 per cent a year. And a big question in Washington is how to raise this percentage, how to make the economic growth of the country increase more rapidly.

One way is tax reform. As long as income taxes take 52 per cent of profit from corporations, corporations are left with relatively little to reinvest. The same is true about the individual's high income tax rate.

It is the corporations, big and small, and the people with high incomes who have money that they can risk, who make new jobs and buy new machines. This is the way that America achieved economic growth in the past, and it is the way that America is growing now. It follows logically that if these people and corporations had more money to invest, America would grow faster.

(Continued on page 146)

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• The men who pull the switches will tell you what can happen when a switch, *believed* to be open —*isn't*. A lot of things can happen—and every one of them is bad. Personnel safety is in jeopardy. Motors can single-phase. Machinery and work can be damaged. Down-time can skyrocket.

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LIGHTING PANELBOARDS — A 4-page descriptive folder featuring a line of plug fuse and toggle switch panelboards for lighting control circuits is now available from Frank Adam Electric Co., 3650 Windsor Pl., St. Louis, Mo. The folder includes box sizes, details of construction, wiring gutters, special features, and catalog numbers.

Write in No. D100 on card, pg. 17

CIRCUIT PROTECTION — A 24-page illustrated handbook contains suggestions for selecting the right kind of protection for electric circuits, motors, appliances and apparatus. Includes motor wiring diagrams and a complete list showing proper size fuses to use. Available from Bussman Mfg. Co., University at Jefferson, St. Louis 7, Mo.

Write in No. D102 on card, pg. 17

MODULAR LIGHTING—A twelve-page folder describing and illustrating their line of surfaced and recessed fluorescent modular fixtures is announced by Moe Light of Thomas Industries Inc., Lighting Division, Brook & Broadway, Louisville, Ky. Complete coefficient of utilization and candlepower distribution tables are included for each set of fixtures.

Write in No. D104 on card, pg. 17

MANHOLE HEATER — A four-page brochure issued by Morrison-Pelsue Co., 2001 S. Bannock St., Denver 23, Col., describes and illustrates applications of the MoPeCo Ventilating Heater available in several models, electrical or gasoline engine powered.

Write in No. D105 on card, pg. 17

HYDRAULIC POWER TOOLS—A new bulletin describing their two-speed, fast-approach portable power unit for hydraulic tools such as conduit benders, cable pullers, and pipe pushers is announced by Greenlee Tool Co., Rockford, Ill.

Write in No. D108 on card, pg. 17

CONDUIT WIREHOLDERS — A new information sheet describing their line of all-purpose conduit wireholders is now available from Knox Porcelain Corp., P. O. Box 2031, Knoxville, Tenn. The illustrated sheet gives installation information, design features, and specifications.

Write in No. D109 on card, pg. 17

LAMP GUIDES—Sylvania Lighting Products, 60 Boston St., Salem, Mass., has made available three lamp guides containing general information, technical data, and catalog listings on their lines of fluorescent lamps, incandescent lamps, and mercury lamps.

Write in No. D110 on card, pg. 17

PLUGS, RECEPTACLES — Two basic designs — explosion-proof and weatherproof—of Killark plugs and receptacles are fully covered in a new catalog section. This line offers many advantageous features, and is available in many styles and sizes to fit various boxes. Killark Electric Mfg. Co., Easton and Vandeventer Ave., St. Louis 13, Mo.

Write in No. D111 on card, pg. 17

ELECTRICAL DEVICES — Two publications, the pocket Federalog 111-PR and Bulletin 3-230, have been made available by Federal Pacific Electric Co., 50 Paris St., Newark, N. J. Complete details concerning circuit breakers, panelboards, fusible service equipment, safety switches, industrial motor control and lighting and power panelboards are contained in the 32-page pocket-sized catalog. The 8-page bulletin is devoted to the company's new line of QMQB fusible switches and panelboards.

Write in No. D112 on card, pg. 17

BUILT-IN HEATERS—Thermador Electrical Manufacturing Co., 5119 District Blvd., Los Angeles 22, Calif., has announced the availability of three new catalog sheets on their line of built-in electric heaters. The heaters described are their portable radiant-fan heater, electric ceiling heater, and baseboard electric heater.

Write in No. D113 on card, pg. 17

PRICE SERVICE—Specimen copies of the National Price Service price books are available on request from Henderson-Hazel Corp., 13601 Euclid Ave., Cleveland 12, Ohio. Please indicate whether you are a contractor or wholesaler. Each specimen includes a complete index, a representative sampling of completely illustrated price sheets, and information of special interest to those concerned with pricing electrical construction materials.

Write in No. D114 on card, pg. 17

FLUORESCENT FIXTURES—The new Miller Sabre fluorescent fixture is illustrated in the Sabre catalog, page 13, published by The Miller Company, Meriden, Conn. This page points out application, construction details, and dimensional, illumination, and installation data.

Write in No. D115 on card, pg. 17

CABLE SUPPORTING TRAYS—The Globe Co., 4000 South Princeton Ave., Chicago 9, Ill., has made available a new catalog on their line of cable supporting tray systems and accessories. The catalog contains information on design features, specifications, and installation.

Write in No. D116 on card, pg. 17

CENTRIFUGAL ROOF VENTILATORS—An 8-page, two-color folder (SDA-220) gives construction features, performance data, dimensions and recommended specifications for the new Centrifugal Roof Ventilator manufactured by The Peerless Electric Company, Warren, Ohio. Other important Peerless Fan and Blower products and a list of Peerless sales representatives are also included.

Write in No. D117 on card, pg. 17

ELECTRICAL FITTINGS—A 30-page illustrated catalog and price list of electrical fittings is now available from the Bridgeport Fittings, Inc., 209 Center St., Bridgeport, Conn. The catalog is loose-leaf type and contains complete ordering data for the wide range of fittings and devices in this line.

Write in No. D119 on card, pg. 17

SPACE HEATING GUIDE—Cavalier Corp., Chattanooga 2, Tenn., has prepared a Guide for Calculations on Electric Space Heating. It is based on a study of several thousand installations of electric heat and is a handy reference for calculating electric heating requirements and estimating operating costs. The booklet contains discussion, charts and floor plan examples.

Write in No. D120 on card, pg. 17

NON-METALLIC FIXTURES — A new complete condensed catalog with list prices covering their complete line of non-metallic lighting fixtures is now available from Union Insulating Co., P. O. Box 351, Parkersburg, W. Va.

Write in No. D122 on card, pg. 17

CONNECTOR BULLETINS — Six new bulletins have been released by Ilsco Corp., 4730 Madison Rd., Cincinnati, Ohio. They cover the Ilsco line of solderless connectors, special connectors, lugs, neutral bars, crimp lugs, and the Ilsco Lok-A-Blok. The bulletins include descriptive material, dimensions, and packaging data.

Write in No. D123 on card, pg. 17

the main characteristic of every Sorgel dry-type transformer is...

QUIET QUALITY

Still setting the industry's pace for lowest sound levels . . . Sorgel's New 1960 Line features additional reductions in size and weight!

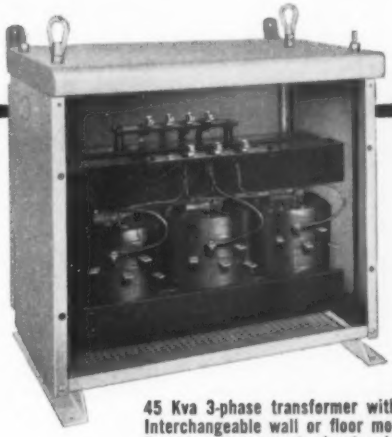
A great many independent authorities agree that Sorgel Sound Rated Dry-Type Transformers have historically been the industry's Quiet Quality line. Biggest human reason why: Men with a desire for excellence make Quiet Quality a crusade at Sorgel. Significant results: (1) The industry's lowest sound level. (2) Unexcelled overload capacity. (3) Unequalled operating efficiency. (4) Long range economy. Proof: Certified tests and case history engineering data, furnished upon request, substantiate Sorgel's Quiet Quality performance. Customer benefits: Complete satisfaction and appreciation.

Sorgel also offers these proven advantages:

- **Lower Copper Loss** — *Coils are liberally designed for the most effective use of the latest developments in insulating materials, have large air ducts for low hot spot temperature and are vacuum-impregnated to provide a co-ordinated insulation system.*
- **Lower Core Loss** — *Cores are designed with the industry's lowest magnetic flux densities, resulting in low core loss and the lowest sound level. Entire unit is secured within a substantial frame. Large units are mounted on vibration dampers to minimize vibration transmission to adjacent areas.*
- **Quicker, Easier Installation**—*The enclosure is self-supporting and entrance can be made on sides, top, bottom, or back. Connecting is made easier by means of solderless connectors on terminal blocks in roomy connection compartments. Units up to 75 Kva single phase and 45 Kva 3 phase are furnished for interchangeable wall or floor mounting.*

The same quiet SORGEL transformers are also incorporated in substations. Procurable with any type or make of switchgear, or from any electrical manufacturer. Contact Sorgel today for the Double "Q" in dry-type transformers . . . Quiet Quality.

1500 Kva, 3-phase, 12,000 volt unit substation with automatic fan cooling system to increase capacity 33%, primary fused load break switch, secondary metering with main fused switch and semi-drawout fusible feeder air circuit breakers.



45 Kva 3-phase transformer with taps. Interchangeable wall or floor mounting. Front panel removed, showing interior.

Complete Line for Every Purpose up to 10,000 Kva, up to 15,000 Volts, Including Special Transformers and Saturable Reactors

SORGEL ELECTRIC COMPANY

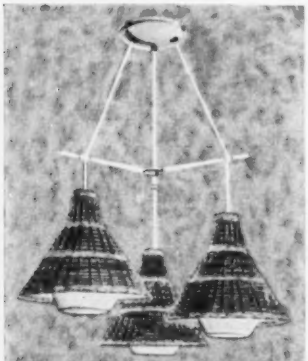
835 West National Ave., Milwaukee 4, Wisconsin

Sales engineers in principal cities. *Consult the classified section of your telephone directory or communicate with our factory.*

the light idea®

SUN 'N SAND Unique, different . . . appealing! Shades are an arresting blend of imported Italian sand-tone reed, handwoven with glistening brass accents. Satin white, vacuum formed styrene diffuser. Sun 'N Sand — original . . . beautiful . . . modern!

V-5675 For hallways or tasteful accent lighting. Length 8¼", diameter 6½". One 100-W.



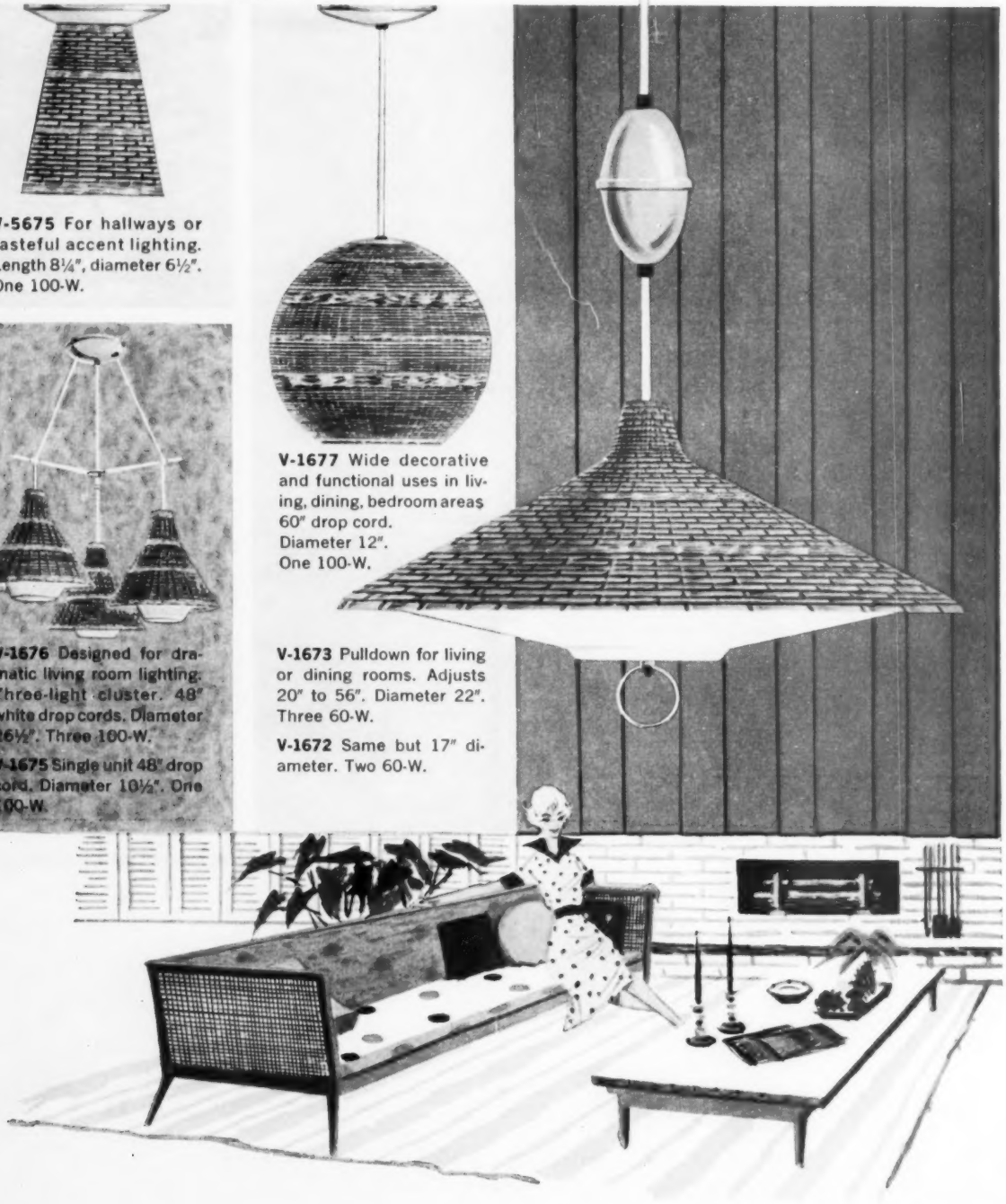
V-1676 Designed for dramatic living room lighting. Three-light cluster. 48" white drop cords. Diameter 26½". Three 100-W.

V-1675 Single unit 48" drop cord. Diameter 10½". One 100-W.

V-1677 Wide decorative and functional uses in living, dining, bedroom areas 60" drop cord. Diameter 12". One 100-W.

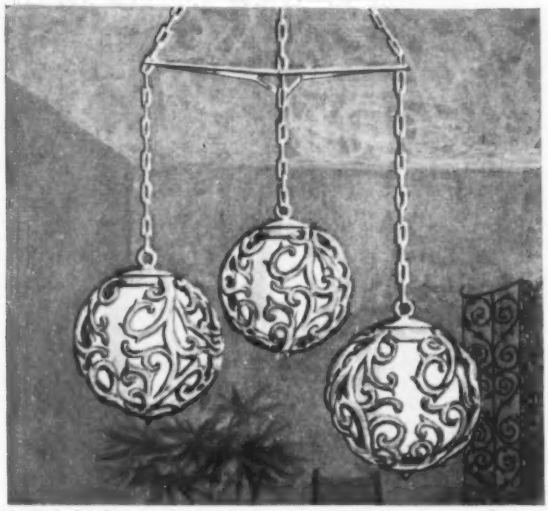
V-1673 Pulldown for living or dining rooms. Adjusts 20" to 56". Diameter 22". Three 60-W.

V-1672 Same but 17" diameter. Two 60-W.



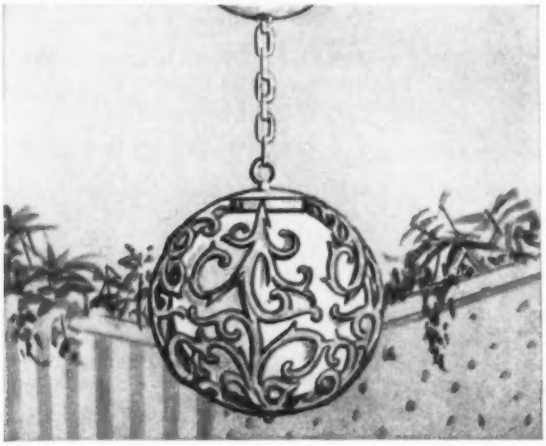
new custom creations

FLORENTINE SERIES Exquisitely detailed scrolls cast in aluminum. Antique white color delicately toned with gold fleck. White opal globes. Matching white chain. Here is new richness for all homes — contemporary, transitional, traditional!

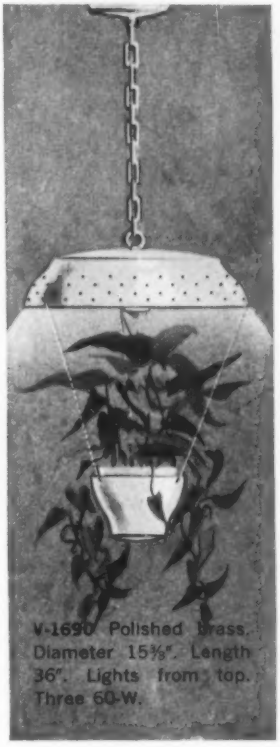


V-1713 Perfect in foyers, living rooms, dining areas. Spread 31" (6' chains and yolk). Three 100-W.

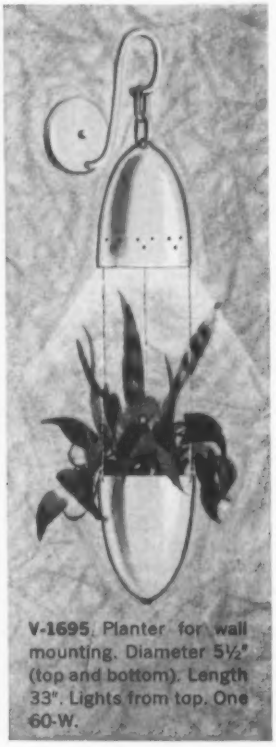
V-1712 Majestic! Diameter 12". Matching white 6' drop chain. V-1710 diameter 10". One 150-W.



PLANTER SERIES Bright ideas! Lighting fixtures that double as planters. Perfect accents for fireplace, entranceways, in dinettes or family rooms . . . wherever you want a touch of eye-catching beauty!



V-1690 Polished brass. Diameter 15⅜". Length 36". Lights from top. Three 60-W.



V-1695 Planter for wall mounting. Diameter 5½" (top and bottom). Length 33". Lights from top. One 60-W.

These are just a few of the fresh, new custom creations available... fixtures so delightfully different and irresistibly styled... "to show is to sell." Free colored brochure describing the full line available. See your nearest Virden Lighting distributor or write direct using the coupon below.

VIRDEN LIGHTING

MEMBER AMERICAN HOME LIGHTING INSTITUTE

VIRDEN LIGHTING DEPT. ES-6
DIVISION OF JOHN C. VIRDEN COMPANY
5209 EUCLID AVENUE
CLEVELAND 3, OHIO

Name_____

Address_____

City_____ Zone____ State____

SUBSIDIARIES: LIGHTING DYNAMICS, INC., LOS ANGELES, CALIF. AND DALLAS, TEXAS; JOHN C. VIRDEN, LTD., TORONTO, ONTARIO.

CATALOGS and BULLETINS

Available Free to Readers of Electrical South upon Request

TROFFER CATALOG—A 36-page catalog, with complete information on their newly re-designed architectural troffers has been released by Smithcraft Lighting Division, Chelsea, Mass. Divided into sections for selection of lighting units, the catalog gives complete illustrations and data for 1 and 2 foot troffers in all types of ceiling construction. Also included in the catalog is information on ceiling lighting patterns, shielding designs, lighting techniques and applications.

Write in No. D128 on card, pg. 17

LIGHTING FIXTURES—Progress Manufacturing Co., Castor Avenue and Tulip Street, Philadelphia 34, Pa., announces the publication of two new lighting catalogs. "Lighting by Progress," a 52-page booklet, describes their line of residential fixtures. "Home Lighting by Minute Mount" is a 12-page bulletin illustrating new ideas in budget lighting.

Write in No. D131 on card, pg. 17

MOTOR CONTRACTORS — For control of large motors, primary switching of induction furnace transformers, and other high voltage applications, **Allis Chalmers Manufacturing Co.**, Milwaukee 1, Wis., has developed the **high voltage air-break contractors** (type 256A) which are described in a bulletin issued by the company.

Write in No. D132 on card, pg. 17

ELECTRICAL DUCTS — A brochure is now available from Johns Manville, 22 East 40th St., New York 16, N. Y., describing their line of Transite electrical ducts. The two-color, 11-page, illustrated bulletin contains information on composition, methods of manufacture, applications, costs, and installation. Also included are shipping weights and dimensions of Transite conduit and Korduct.

Write in No. D133 on card, pg. 17

TRANSFORMERS—R T & E Corp., 1900 E. North St., Waukesha, Wis., has available a bulletin describing Terra-Tran transformers for residential underground distribution. The 15-page booklet is illustrated and contains complete information on construction, application, and design features.

Write in No. D135 on card, pg. 17

RADIANT HEATING — Ceilheat, Inc., 5212 Homberg Dr., Knoxville, Tenn., has announced the availability of a bulletin describing their line of concealed radiant home heating systems. The bulletin includes the principles of radiant heating, installation procedures, and advantages of this heating system.

Write in No. D138 on card, pg. 17

LIGHTING FIXTURES — A 28-page, illustrated booklet from Lavery and Co., Inc., 15479 Starthern St., Van Nuys, Calif., describes their line of lighting fixtures for western, ranch, early American, homestead, and ranch modern homes. Specifications and catalog data are included.

Write in No. D139 on card, pg. 17

EXPLOSION-PROOF EQUIPMENT —"An Electrical Engineer Comes to Crouse-Hinds" is the title of a new 6-page folder by Crouse-Hinds Co., Syracuse 1, N. Y. The bulletin describes design and construction principles involved in manufacturing Crouse-Hinds Condulet electrical equipment for hazardous locations.

Write in No. D140 on card, pg. 17

RESIDENTIAL LIGHTING — A new catalog featuring their line of residential lighting fixtures has recently been issued by John C. Virden Co., 6103 Longfellow Ave., Cleveland 3, Ohio. The 48-page booklet is illustrated and in color. It pictures and describes incandescent and fluorescent fixtures for every room in the house and every design motif.

Write in No. D141 on card, pg. 17

HYDRAULIC EQUIPMENT—Truck Equipment Co., 3963 Walnut St., Denver 5, Colo., has made available a catalog containing information on their lines of hydraulic derricks, cable reel carriers, and diggers. It is illustrated and contains data on design features, specifications, and application.

Write in No. D142 on card, pg. 17

WATER HEATING BOILER — Precision Parts Corp., 400 N. First St., Nashville 7, Tenn., has available a bulletin containing catalog information on their electric hot water heating boiler, diagrams of the boiler, and data on the advantages of its use. The boiler comes complete with water circulator and safety valve on models A through K.

Write in No. D143 on card, pg. 17

FLOOD LIGHTING STANDARDS — An 11-page booklet describing their line of flood lighting standards is available from Kerrigan Iron Works, Inc., P. O. Box 479, Nashville 2, Tenn. Contained in the booklet are catalog data, diagrams of the equipment, specifications, and suggested methods of wiring supply to floodlights, as well as other installation procedures.

Write in No. D144 on card, pg. 17

CONNECTOR TOOLS—The Thomas & Betts Co., Inc., 72 Butler Street, Elizabeth 1, N. J., makes available catalog D59 including new compression connectors and installing tools recently developed. The tools are for use at usual distribution voltages and for "hot line" applications. New heavy duty tap connectors, double taps, stirrups and single sleeve ACSR tension splicers have many exclusive features and are designed to give high performance and easy installation.

Write in No. D145 on card, pg. 17

WIRING EQUIPMENT — An abridged catalog of industrial, commercial, and residential wiring items, gives all specifications for such wiring needs as switches, adapters, receptacles, and cord sets made by the Leviton Manufacturing Co., Inc., Brooklyn 22, N. Y. Designed for distributors and contractors, the catalog includes catalog numbers, prices, packing, weights, descriptions and indexes.

Write in No. D146 on card, pg. 17

CLUSTER MOUNT—Specifications and installation method for the new cluster mount bracket made by Minit-Mount Sales Co., 775 Wooster Rd., N.. Barberton, Ohio, are now available in the company's new booklet. Illustrated with photographs and diagrams, the booklet shows in detail how to make safe installations of transformers, capacitor banks, and line type oil circuit reclosers.

Write in No. D147 on card, pg. 17

ELECTRIC HEATERS—The new catalog of electric space heating equipment available from Meier Electric, 3525 E. Washington St., Indianapolis 7, Ind., includes complete details on the Meier Tandem Plug-In baseboard heaters, wall insert heaters, radiant heat cable, and portable units. Included in the brochure is the Meier's Heat Determinator, a simplified guide to electric space heating application.

Write in No. D148 on card, pg. 17

"G-E Remote-Control Wiring has saved money since the day it went into this building in 1953," says Mr. Donnelly, standing in front of 3-story, block-long office building, Menands, N. Y.

"G-E Remote-Control Wiring saved us $20,561 in this N. Y. Telephone building - on installation alone!"

... Mr. H. J. Donnelly, Supervising Electrical Engineer New York Telephone Company, Albany, N.Y.

"We compared General Electric Remote Control with an ordinary switching system that would give us the kind of lighting control we wanted," says Mr. Donnelly. "We were surprised to find that, in addition to its other advantages, the G-E low-voltage system cost $20,561 less to install!

"On top of the initial savings, we reduced our operating costs, because G-E master switching makes it easy for maintenance crews to turn ON only those lights needed, rather than lighting up whole floors. Switches at convenient locations save our men extra steps, too.

"These savings were all in addition to the original reason we considered Remote-Control. That was extra safety in controlling the 480Y/277-volt power system we chose for its saving in branch circuit copper. Remote-Control relays in the ceiling control the 277-volt lighting circuits, so there's only a low, 24 volts at the switches. Of course, the lightweight, 24-volt switch wiring makes it easier to relocate office partitions, too. And the elimination of switch-loop voltage drops that can cut the life and efficiency of lamps, is still another feature."

General Electric would appreciate the opportunity of working with you on the design of a Remote-Control Wiring System tailored to fit your particular needs. Write Commercial Engineer, General Electric Company, Wiring Device Department, Providence 7, Rhode Island.

"Douse the lights you don't need!" is standard procedure for maintenance crew, in building from 5:00 to 11:00 p.m. G-E Remote Control makes it easy.

G-E master selector switches at ends and center of each floor control lighting separately for each ½ floor. Building contains 2000 fluorescent lamps.

Progress Is Our Most Important Product

GENERAL ELECTRIC

BELL

makes and recommends only SOLID BRASS WEATHERPROOF WIRING DEVICES

Bell's field and laboratory tests have proved that only rugged, Solid Brass weatherproof plates can stand up, year in —year out, regardless of weather and heavy use.

Want more proof . . . just look at this list of exclusive Solid Brass advantages

- **Bell Solid Brass** will withstand sudden shock and impact, will not crack or shatter
- **Bell Solid Brass** is impervious to salt air, smoke, industrial gases, fumes and steam
- **Bell Solid Brass** will not flake, peel, pit or corrode
- **Bell Solid Brass** is unaffected by lime or acids found in brick, mortar, lime and cinder block
- **Bell Solid Brass** wears better, lasts much longer in any climate . . . even in coastal areas

SOLID BRASS PLATE *with* Saf-T-Lok® COVER

snaps open — stays open — snaps shut

.040 SOLID BRASS

BAKED ALUMINUM FINISH

BELL ...better to buy ...easier to sell

Write for fully illustrated catalog

Look for this Label . . . A sign of Quality

BELL

BELL ELECTRIC COMPANY 5735 S. CLAREMONT AVENUE, CHICAGO 36, ILLINOIS

America's Largest Line of Weatherproof Devices and Covers

Wilson P. Bird — Bell Electric Representative in the South

INFORMATION CENTER

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Help yourself to free literature and more details on any product mentioned in this issue.

Instead of writing a dozen different manufacturers for free literature and more information on products, tools, or services, just insert on the cards below the appropriate key numbers of the items in which you are interested. These cards may be used to get information on products mentioned in the following departments (see Contents Page for page number):

Catalogs and Bulletins — New Electrical Products
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Be sure to print or write legibly your name and address—drop it in the nearest mail box and

ES pays the postage!

JUNE, 1960

Send free information on these NEW PRODUCTS and/or services (fill in key numbers):

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Send free information on these ADVERTISEMENTS:

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My Name _____ Position _____
My Company's Name _____
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City _____ Zone ____ State _____

JUNE, 1960

Send free information on these NEW PRODUCTS and/or services (fill in key numbers):

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Send this FREE LITERATURE (fill in key numbers):

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Send free information on these ADVERTISEMENTS:

Company _____ Page ____ Company _____ Page ____
Company _____ Page ____ Company _____ Page ____

My Name _____ Position _____
My Company's Name _____
Address (number and street) _____
City _____ Zone ____ State _____

These cards can help you get valuable information

Postage Will be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 582, SEC. 34.9, P. L. & R., ATLANTA, GA.

Electrical South

806 PEACHTREE ST., N. E.

ATLANTA 8, GEORGIA

Postage Will be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 582, SEC. 34.9, P. L. & R., ATLANTA, GA.

Electrical South

806 PEACHTREE ST., N. E.

ATLANTA 8, GEORGIA

FREE—$50 IN REMCON DEVICES!

Builders, architects, homeowners—today *everyone* is looking for the little touches of luxury that make a home more desirable, more saleable. Low-voltage switching is just the "extra" that can help you provide *your customers* with comfort and convenience through electricity. And now with REMCON, the low-voltage system that's practical in any home regardless of cost, you can do it at a profit!

WHAT IS LOW-VOLTAGE SWITCHING?

Low-voltage switching is the greatest advance in light control since the pull chain. By eliminating the need for elaborate, costly wiring, it provides the ultimate in versatility and safety through multi-point, master-control and path-of-light switching. Low voltage switching also ends shock hazard by putting only 6 volts at the switch.

4 REASONS WHY REMCON IS EASIER TO INSTALL

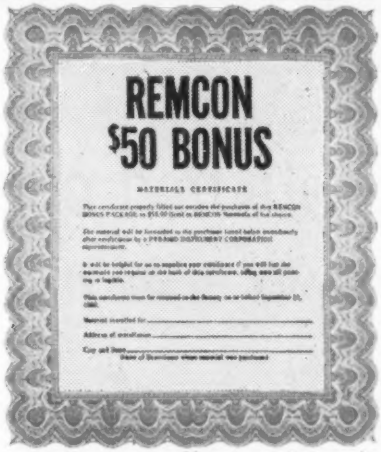
REMCON builds the transformer *right into the relay* to make low-voltage switching easier four ways: 1. No separate low-voltage source (eliminates additional wiring); 2. No complicated systems. With REMCON, installation is as simple as connecting the three wires of the relay to the three color-coded wires of the switch; 3. No more need to run heavy armored cable from fixture to switch; in fact...4. No more switch box! Any way you look at it, there's no longer any reason to shy away from modern low-voltage wiring—especially when you think of the time, labor and money it saves!

THOUSANDS OF DELIGHTED USERS

Contractors everywhere are delighted with REMCON'S flexibility, whether they wire tract or custom homes. Read these:

"Remcon helps me provide luxury at a profit even in a $15,000 home. I can build in three- and four-way switching quickly—*at lower labor costs*—because Remcon's #18 wire *staples* to studs. I'm sold, and my tracts go just as fast." *Sidney Gotowner, Gotowner Electric.*

"Even in a custom home, small details like Remcon's pilot-light switches and hi-fashion switch plates are appreciated. Remcon plates, for example, blend with and enhance any room's decor. They're practical in *any* home." *Ephraim Berkowitz, Turnpike Electric.*



REMCON—THE ANSWER TO CUTTHROAT COMPETITION

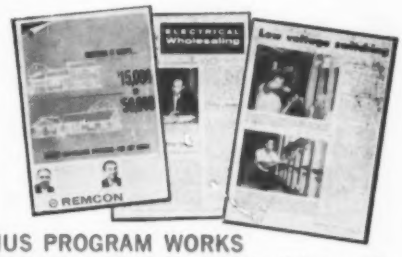
The need for contractors to "trade up" their customers is so important today that the National Electrical Contractors' Association made it the prime topic of discussion at their recent convention. How do *you* break out of the vicious circle of low bids, cheap services, poor or no profits? By offering the "plus" that pulls you away from the pack...REMCON!

NOW ACTUALLY COSTS LESS!

Before this $50 Bonus Program, the ease of installing REMCON was more than enough to offset the slight expense over outmoded, conventional wiring. But even that's been changed. Now REMCON gives you a Certificate worth $50 in the REMCON devices of your choice—just for trying REMCON on your next job.

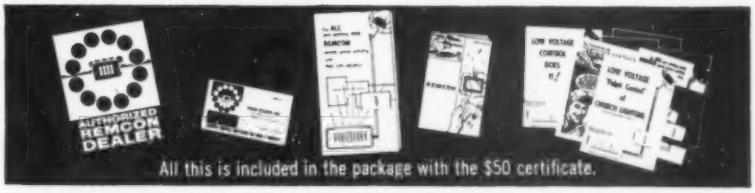
REMCON SUPPORTS YOUR SELLING EFFORTS

To make it still easier for you to sell, REMCON is now in the midst of an extensive advertising and promotion campaign which includes full-page colorful ads, direct mailings to builders and architects, and an intensive publicity effort that has paid dividends in a steady barrage of articles in leading newspapers and magazines.



HOW THE $50 BONUS PROGRAM WORKS

Go to your distributor. Buy your first package of REMCON materials (it's enough to wire the average three-bedroom house). This package will also contain: 1. A *Materials Certificate* worth $50 (list) in the REMCON materials of your choice; 2. A request form for obtaining free business cards imprinted with your name; 3. Free envelope stuffers for you to distribute to your customers; 4. Free truck decals; 5. Complete REMCON literature, including an Electrician's Manual, an illustrated instruction manual, easy-to-follow installation data sheets and wiring diagrams, and articles describing typical industrial and residential REMCON installations. You also get all new information as soon as it's issued. In addition, you will automatically be listed as an *Authorized* REMCON *Dealer*, which entitles you to our free Consultation Service—you send us your prints and we'll send back a REMCON switch layout and a list of the materials needed to do the job. The $50 Bonus Program is now in effect. Go to your distributor today!



REMCON A Division of Pyramid Instrument Corp., 630 Merrick Road, Lynbrook, N. Y., Dept. ES-60

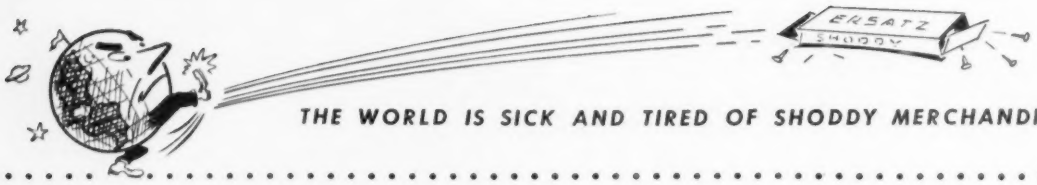
Okay REMCON, sign me up as an Authorized REMCON Dealer, send me your *free Information Kit* and the name of my local REMCON Distributor. I understand I am under no obligation.

Name_____

Address_____

City_____ Zone_____ State_____

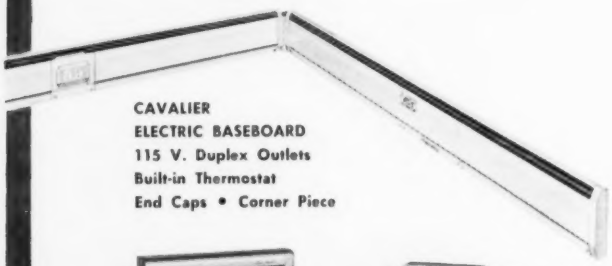
MAIL NOW



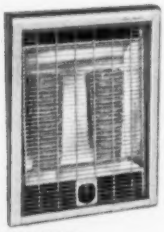
THE WORLD IS SICK AND TIRED OF SHODDY MERCHANDISE

happy, satisfied customers

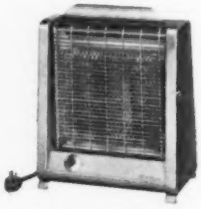
boost your business more than anything else



CAVALIER
ELECTRIC BASEBOARD
115 V. Duplex Outlets
Built-in Thermostat
End Caps • Corner Piece

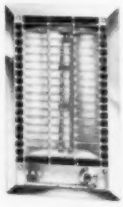


CAVALIER
WALL INSERT
1 to 5 KW



CAVALIER PORTABLE
2, 3, 4 KW

CAVALIER
CABLE
HEAT



CAVALIER BATHROOM
Automatic and
non-automatic
120 and 240 volt

Cavalier...

your assurance of Highest Quality

CAVALIER heating equipment has the genuine quality that sells, pleases customers and eliminates costly service calls.

CAVALIER has a complete line, and backs its products with written guarantees.

CAVALIER heating equipment is soundly engineered, thoroughly tested and built for long life. Although repair parts are rarely needed, they are promptly available at reasonable cost.

CAVALIER keeps within efficient trade channels, and works to assure business-like profits for distributor and contractor.

CAVALIER is nationally advertised and backs its highest quality products with complete sales and merchandising helps which are available on request.

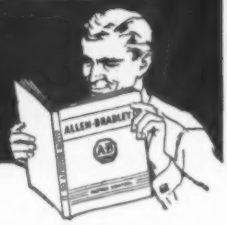
ELECTRIC HEATING DIVISION **CAVALIER CORPORATION** CHATTANOOGA 2, TENNESSEE

OVER 90 YEARS OF QUALITY PRODUCTS

FIRST *in quality construction*
in engineering advances
in safety
in sales making features

Some more special controls that are "standard" with Allen-Bradley!

Even Khrushchev couldn't claim a more complete line!



Phase Failure Phase Reversal Relays

The Bulletin 812 Style RF relay responds to *all* open phase conditions on a branch motor circuit and immediately removes the motor from the line. Also, the motor is disconnected when a phase reversal occurs anywhere in the system on the line side of the relay. "Fail safe" design.

Phase Failure, Style F covers f.l. currents from 1.5 to 300 amp in 4 sizes. Coils to 600 v, 60 cycles.

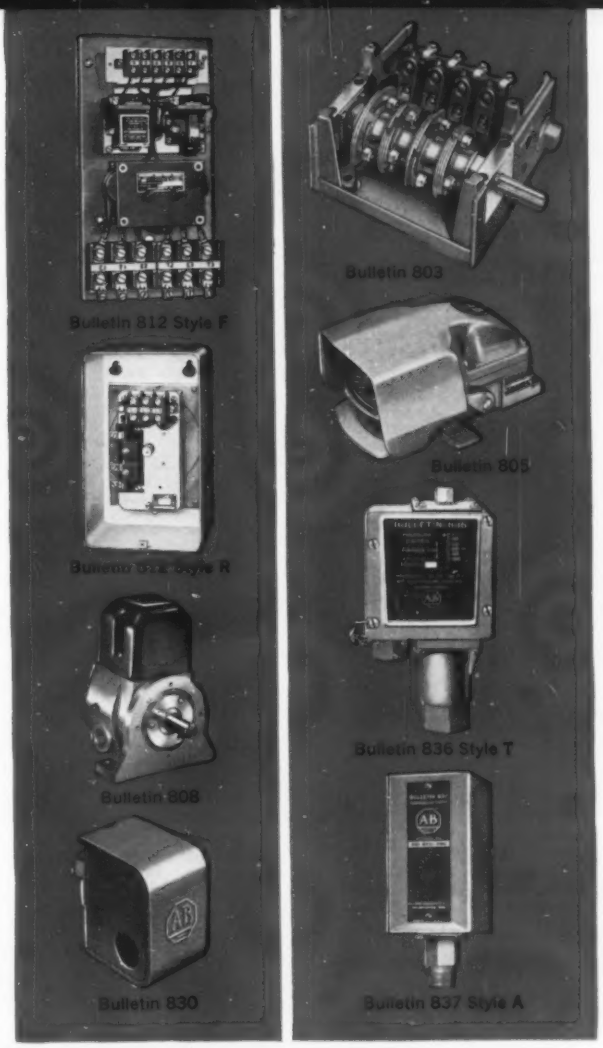
Phase Reversal, Style R made with coils for 110, 208/220, 440, 550 v for either 50 or 60 cycles.

Zero Speed Switch

Used for "plugging" duty, these switches prevent coasting and bring squirrel cage motors to a sudden stop. Also used to prevent application of reverse power before motor comes to a full stop. Adjustable operating speed.

Low Pressure Switch

Especially designed for domestic water pump service and commercial air compressor service. These inexpensive compact switches offer pressure ranges from 15 to 200 psi.



Rotating Cam Limit Switches

Heavy-duty pilot controls used on rotating machines to initiate functions at any point of rotation. Made with up to 12 individually adjustable, independent circuits.

Foot Switches

Built for toughest service. Has maintenance free, snap-action contacts. Extended base prevents tipping. Made with hood (left), with top guard and without guard.

Pressure Controls

Oiltight enclosure for machine tool hydraulic systems operating at pressures up to 5000 psi. Operating pressure and differential are adjustable. Indicator shows trip point. Silver contacts never need service attention.

Temperature Controls

Newly designed bellows provides lower differentials. Rugged construction permits continuous cycling from zero to maximum setting. Vibration or mounting angle will not affect accuracy of operation. Temperature ranges from —150°F to 490°F.

ALLEN-BRADLEY Member of NEMA — **Quality Motor Control**

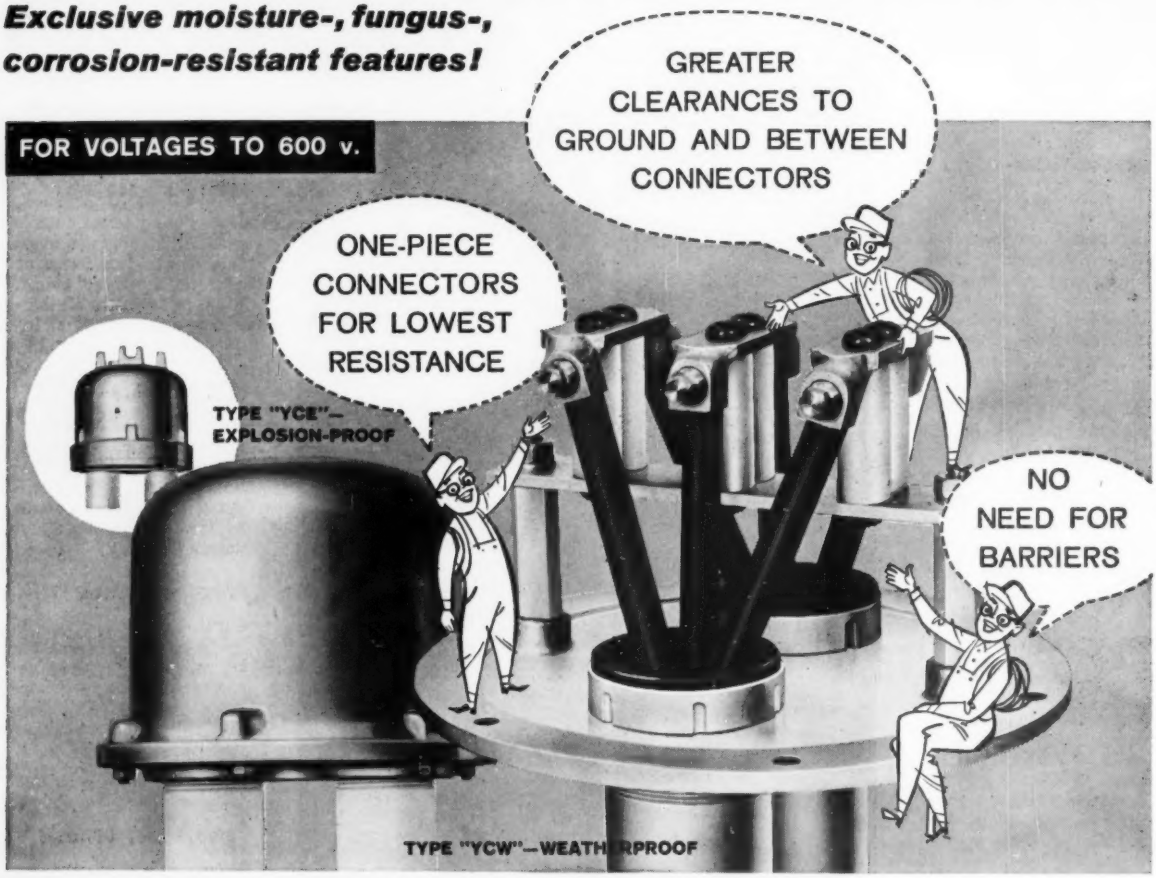
Allen-Bradley Co., 1305 S. First St., Milwaukee 4, Wis. • In Canada—Allen-Bradley Canada Ltd., Galt, Ont.

CONSULT YOUR LOCAL ALLEN-BRADLEY REPRESENTATIVE

ATLANTA—Roy E. Wilson Co., 1062 Northside Drive, N. W., Tel: TRinity 6-8833
BALTIMORE—H. M. Wood & Co., Inc., 124 Light St., Tel: MUlberry 5-4643
BIRMINGHAM—J. L. Howarth Co., Inc., 825 S. 22nd St., Tel: FAirfax 3-1171
CHARLESTON—Henry E. Payne, 918 Kanawha Blvd., E., Tel: DIckens 3-1393
CHARLOTTE—LeRoy P. Spoon, 307 Lincoln St., Tel: EDison 4-6334
DALLAS—J. K. Webb, 2810 McKinney Ave., Tel: TAylor 3-6179
HOUSTON—Allen-Bradley Co., 2105 McKinney Ave., Tel: CApitol 5-0747
JACKSONVILLE—Robert P. Smith & Co., 1446 June St., Tel: EXbrook 8-0531
KANSAS CITY—B. L. McCreary & Son, 1819 Central St., Tel: HArrison 1-1668
KNOXVILLE—Bowditch & Co., 1311-C N. Broadway, P. O. Box 3145, Tel: 4-2513
LITTLE ROCK—Curtis H. Stout, Inc., 400 Shall St., P. O. Box 107, Tel: FRanklin 4-8201
LOUISVILLE—The Rietze Company, 2209 S. Floyd St., Tel: MElrose 7-3603
MEMPHIS—Curtis H. Stout of Tennessee, Inc., 718 M & M Bldg., Tel: JAckson 6-7601
MIAMI—Charles R. Lee & Assoc., Inc., 3524 W. Flagler St., Tel: Highland 4-7414
NEW ORLEANS—Robbins & Robbins, 1037 Magazine St., Tel: JAckson 2-5805
ST. LOUIS—Allen-Bradley Co., 904 N. Grand Blvd., Tel: JEfferson 5-1901
TAMPA—Robert P. Smith & Co., 4025 Henderson Blvd., Tel: 8-3632
TULSA—John W. Elder Co., 1526 East Fourth St., Tel: Diamond 3-9149

NEW! O.Z. PULL-N-SPLICE BOXES!
CONVENIENT·COMPACT·ECONOMICAL

Exclusive moisture-, fungus-, corrosion-resistant features!


FOR VOLTAGES TO 600 v.
GREATER CLEARANCES TO GROUND AND BETWEEN CONNECTORS
ONE-PIECE CONNECTORS FOR LOWEST RESISTANCE
TYPE "YCE"— EXPLOSION-PROOF
NO NEED FOR BARRIERS
TYPE "YCW"—WEATHERPROOF

O.Z. Pull-n-Splice Boxes mark a significant advance in pull box construction!

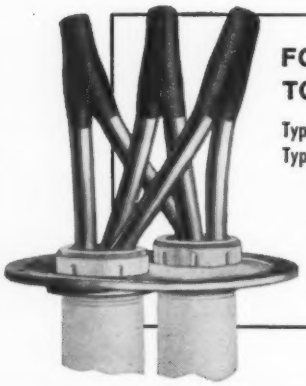
Their highly compact size saves *more space than ever!*

Their more efficient design means *new savings in installation time and labor!*

Their moisture-, fungus-, and corrosion-resistant features mean long, trouble-free service.

Still, with all their features, the new O.Z. Pull-n-Splice Boxes are *smaller* — and *cost far less* than conventional pull boxes . . . even late model *competitive* types! And, you get a bonus in high quality materials and workmanship so characteristic of *all* O.Z. products!

For complete information on these and the many other O.Z. products that mean more for you, call your local O.Z. distributor, or write to the company.



FOR VOLTAGES TO 5000 v.

Type "YPW" — Weatherproof
Type "YPE" — Explosion-proof

Deeper dome than "YCW" and "YCE". Furnished without connector panels. Insulated pigtail splices recommended.

O.Z. ELECTRICAL MANUFACTURING CO., INC.

262 BOND STREET • BROOKLYN 17, N. Y.

- CAST IRON BOXES
- CABLE TERMINATORS
- POWER CONNECTORS
- SOLDERLESS CONNECTORS
- GROUNDING DEVICES
- CONDUIT FITTINGS
- INTERLOCKED ARMOR CABLE FITTINGS

Sales Office and Warehouse: 406 So. Cicero Avenue, Chicago 44, Ill. • ESterbrook 9-0326
Office and Factory: 749 Bryant Street, San Francisco 7, Calif. • GArfield 1-7846

DIAMOND
PRODUCT INDEX

DTX® Non-Metallic Sheathed Cable

It's the WHITE wire. Non-sticking, smooth and easy to pull, DTX will not flake off. Moisture and flame resistant, it is clean to handle and strips easily.

Diamond for years has concentrated on this "Basic Line" of wire and cable products . . . mixing them thoroughly with quality and prompt delivery. And remember, one source Diamond buying saves ordering time, eliminates error . . . increases your profits.

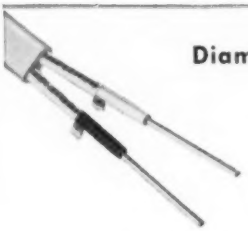
All UL Listed.

Heavy Duty Portable Cords

Available in Red-D-Prene® (red or black neoprene jacket) oil, heat and flame resistant; Black Diamond (black rubber) for general purpose use; and Signal Yellow (yellow thermoplastic) for all locations where heat is no problem.

600 V Building Wire Type THW

New UL listed Thermoplastic building wire for 75° wet or dry application. Small diameter, slick silicone finish. Standard colors in solid and stranded . . . sizes 14 AWG through 4/0.

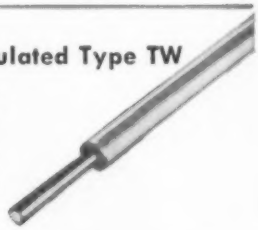


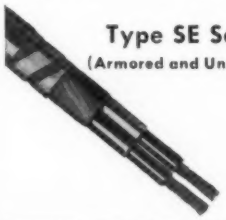
Diamond DUF® Type UF

Thermoplastic insulated and jacketed non-metallic sheathed cable. Retards flame and has excellent resistance to moisture, corrosion, fungus, abrasion. UL listed.

Thermoplastic Insulated Type TW

Diamond DTW is the small diameter building wire that is flame and moisture resistant. Eight permanent colors. Small size allows more circuits in existing conduits. Sizes 14 thru 4/0.





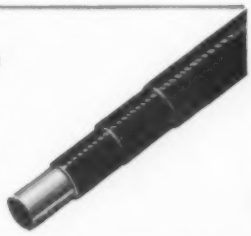
Type SE Service Entrance Cable

(Armored and Unarmored—Copper or Aluminum)

May be used without conduit from pole to building and down side of building in places not subject to mechanical injury. UL listed. Neoprene Aluminum SE also available.

Weatherproof Wire

Triple braid weatherproof covering can be relied upon to meet severe climatic conditions. Available also with neoprene or polyethlyene insulation. Comes in solid and stranded, full range of sizes.



Coiled Heater Cord Set

It's new, convenient, safer to use. Non-tangling six-foot cord retracts to 18 inches. Can be used on any heat-type appliances.

Range Cord Sets

Three wire set is 36" long. Rubber molded cap, rubber jacketed cable, steel strain relief. UL listed.

Bare Copper Wire

Soft drawn bare copper wire is available in a complete range of sizes, solid or 7 stranded.

ACT Armored Cable & Flexible Steel Conduit

Suitable for general wiring in non-fire proof structures. Two, three, four conductor.

Trade Mark ©

DIAMOND
WIRE and CABLE Company
Sycamore, Illinois

WAREHOUSES: Pittsburgh • Cleveland • Minneapolis • Denver • Dallas • Atlanta

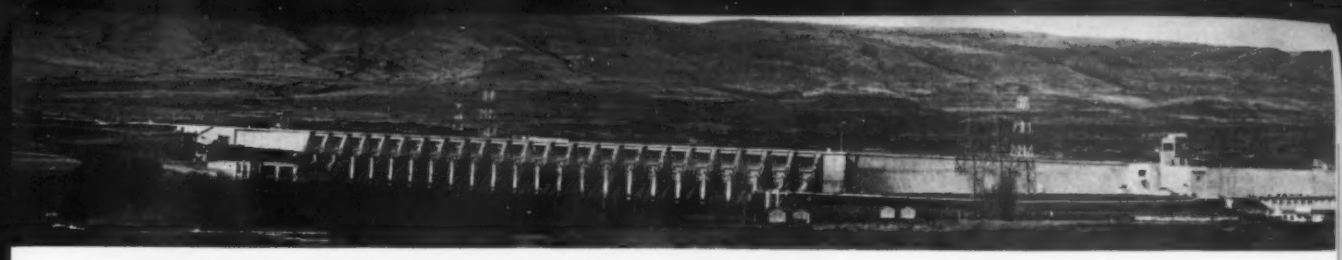
Last year, traffic accidents killed 37,000, injured 1,400,000

. . . and they wasted Five Billion Dollars!

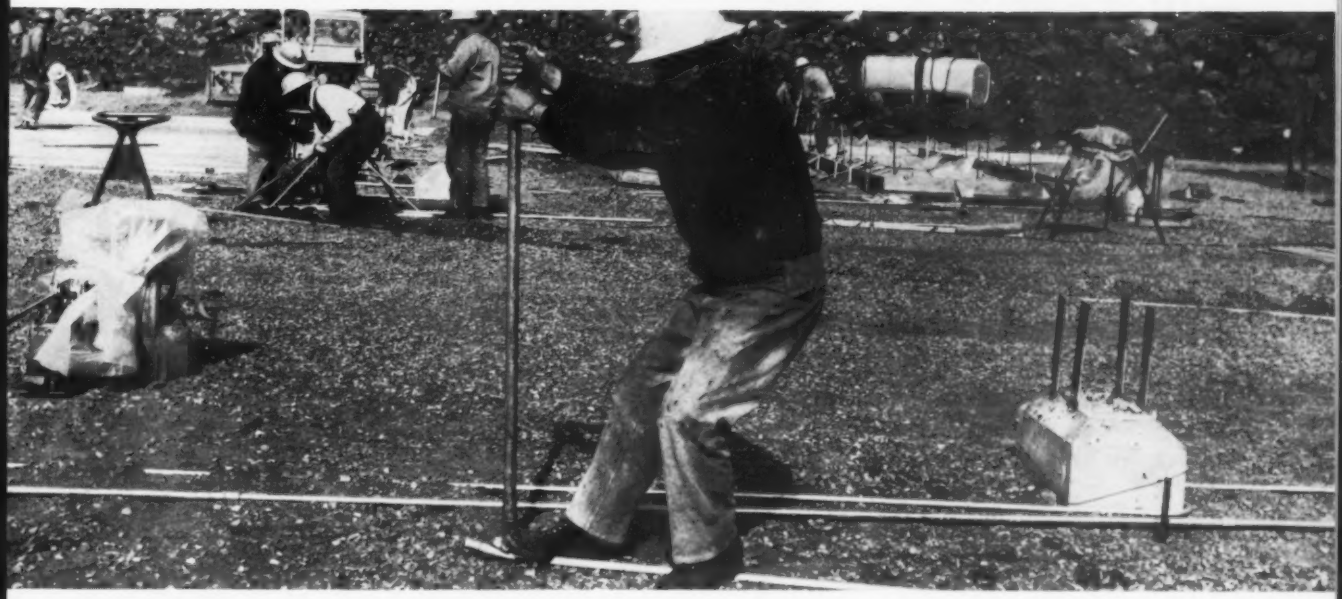
Traffic accidents' human toll is so tragic we sometimes overlook their staggering economic waste. Five Billion Dollars in lost wages, medical expenses, insurance costs and property damage! Your business—every business—shares in this loss. So you have a double interest in helping reduce traffic accidents. And you *can* help! Drive safely and obey the law yourself . . . certainly. But go further. Use your influence to promote safe driving and urge strict law enforcement. To make your efforts more effective, join with others working actively to reduce traffic hazards in your community. *Support your local Safety Council!*

Where traffic laws are strictly enforced, deaths go DOWN!

Published in an effort to save lives, in cooperation with the National Safety Council and The Advertising Council.



At Oregon's Columbia River Dalles Dam



SPANG® Steel Conduit gets 50-year assignment

in U. S. Corps of Engineers Project Building

The U.S. Corps of Engineers designs and builds on a 50-year life basis. This calls for top-quality materials in every project. Because Pitman Electric Company, electrical contractors on the job, knew dependable SPANG HD Galvanized Conduit and SPANGLEAM EMT would meet these specifications, SPANG was used throughout the Corps' new project building for electric heating, lighting and general power.

SPANG uniformity pays off!

Pitman foreman Bert Bixby reported a smooth installation with SPANG, which was due to the conduit's uniformity. The finish held up perfectly on 90° and "horseshoe" bends. Despite outdoor storage, there was no sign of corrosion on the conduit. Inventory and housekeeping was easier with the special safety bundling of SPANG Conduit packages.

Want dependability? Specify SPANG!

You'll get a trouble-free job with years of built-in dependable service with a SPANG Steel Conduit installation. Next time, tell your local distributor to make it SPANG!

General Contractor: James S. Hickey, Portland, Oregon
Electrical Contractor: Pitman Electric Company, Portland, Oregon
Spang Distributor: Eoff Electric Company, Portland, Oregon

SPANG CONDUIT

THE NATIONAL SUPPLY COMPANY
Two Gateway Center, Pittsburgh 22, Pennsylvania
Subsidiary of Armco Steel Corporation

THE BEST FIRST FROM MARKEL

It's not enough to be the world's largest manufacturer of residential heating units . . .

It's not enough to be foremost in manufacturing built-in electric heating equipment for GOLD MEDALLION all-electric homes . . .

No, we don't rest on our laurels . . . we're everlastingly working to bring you

The BEST . . . FIRST from MARKEL!

The INSTANT HEAT FAN-GLO HEETAIRE

that's the HOTTEST Selling Portable Heater in the Industry!

SERVICE FREE!
TROUBLE FREE!
Exclusive Element Support!
Automatic Thermostatic Control!

$19.95 LIST

It's Bigger . . . more PROFIT Margin . . . luxury styling (legs, handle, 2-toning usually found only on more expensive heaters) . . . .quiet fan-forced action and abundant INSTANT Radiant Heat . . . 1650 and 1320 watt models at the *same low price!*

Get the Facts . . . Airmail, Wire or Phone for Literature and Samples . . . to Sales Department, Dept. ES

Get in our **EARLY BIRD PROMOTION**
EXTRA Bonus plus FREE Displays!
HURRY!
Ends July 30, 1960!

Tested! Proved!

The **NEW HIGH-STYLE PORTABLE BASEBOARD HEETAIRE**

. . . at a NEW LOW PRICE!

Automatic . . . with Pilot Light Indicator . . . 1000 watts – 120 V. **$32.95** LIST

1500 Watts . . . $39.95

The world's Largest Manufacturer of Residential Electric Heating Units

MARKEL

Founded 1920 • BUFFALO 3, N. Y.

In Canada: MARKEL ELECTRIC PRODUCTS, Ltd., Ft. Erie, Ont.

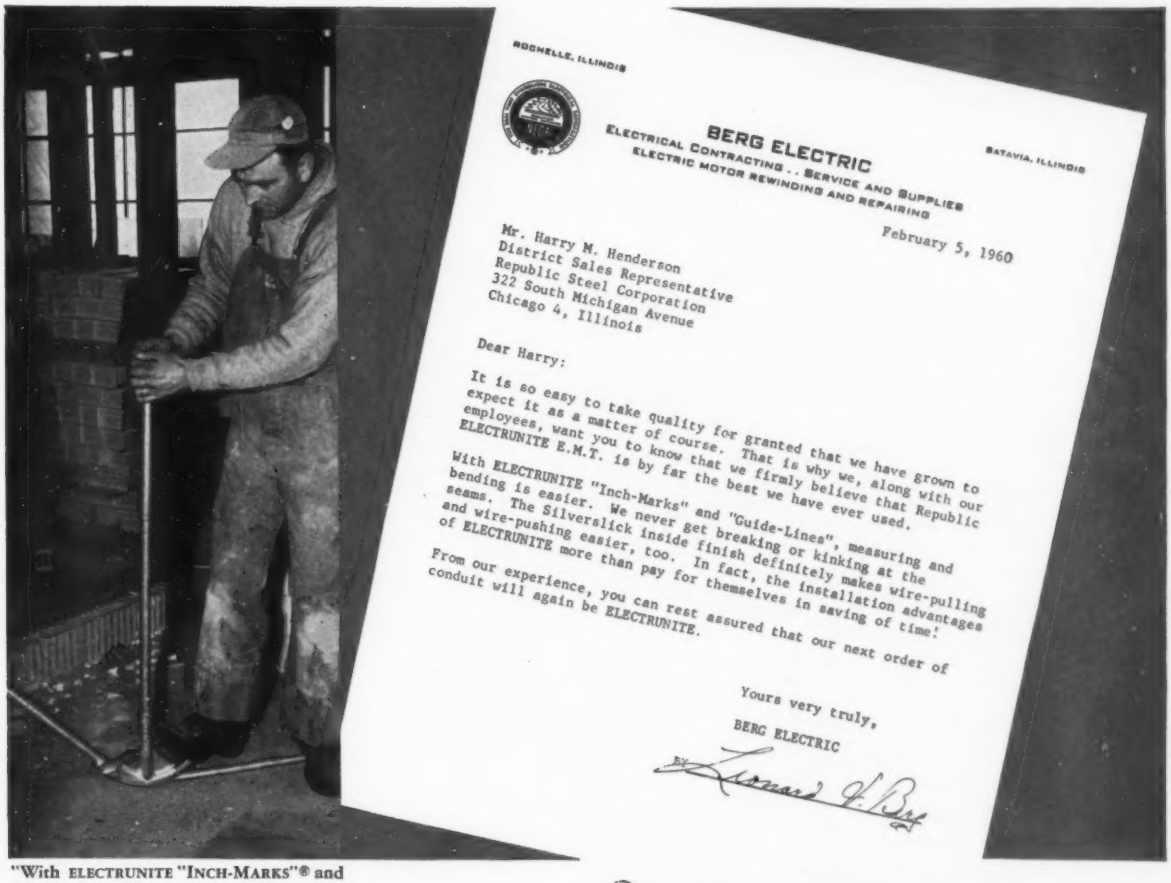
Made by the producers of the nationally-famous FAN-GLO HEETAIRE ... over 2,000,000 now in use!

"More than pays for itself"

Republic ELECTRUNITE Electrical Metallic Tubing because...

THE BEST COSTS LESS INSTALLED

The best testimonial for Republic ELECTRUNITE® Electrical Metallic Tubing is a satisfied user. Leonard V. Berg, Berg Electric, with locations at Batavia, and Rochelle, Illinois, recently completed two major installations using ELECTRUNITE E.M.T. on the job. His letter tells why... The *Best* Costs *Less* Installed!



ROCHELLE, ILLINOIS

BERG ELECTRIC

ELECTRICAL CONTRACTING . . SERVICE AND SUPPLIES
ELECTRIC MOTOR REWINDING AND REPAIRING

BATAVIA, ILLINOIS

February 5, 1960

Mr. Harry M. Henderson
District Sales Representative
Republic Steel Corporation
322 South Michigan Avenue
Chicago 4, Illinois

Dear Harry:

It is so easy to take quality for granted that we have grown to expect it as a matter of course. That is why we, along with our employees, want you to know that we firmly believe that Republic ELECTRUNITE E.M.T. is by far the best we have ever used.

With ELECTRUNITE "Inch-Marks" and "Guide-Lines", measuring and bending is easier. We never get breaking or kinking at the seams. The Silverslick inside finish definitely makes wire-pulling and wire-pushing easier, too. In fact, the installation advantages of ELECTRUNITE more than pay for themselves in saving of time!

From our experience, you can rest assured that our next order of conduit will again be ELECTRUNITE.

Yours very truly,
BERG ELECTRIC
By Leonard V. Berg

"With ELECTRUNITE "INCH-MARKS"® and "GUIDE-LINES"®, measuring and bending is easier."

REPUBLIC STEEL

STEEL AND TUBES DIVISION

REPUBLIC STEEL

Cleveland 8, Ohio

REPUBLIC STEEL CORPORATION
STEEL AND TUBES DIVISION • DEPT. C-9548-A
227 EAST 131st STREET • CLEVELAND 8, OHIO

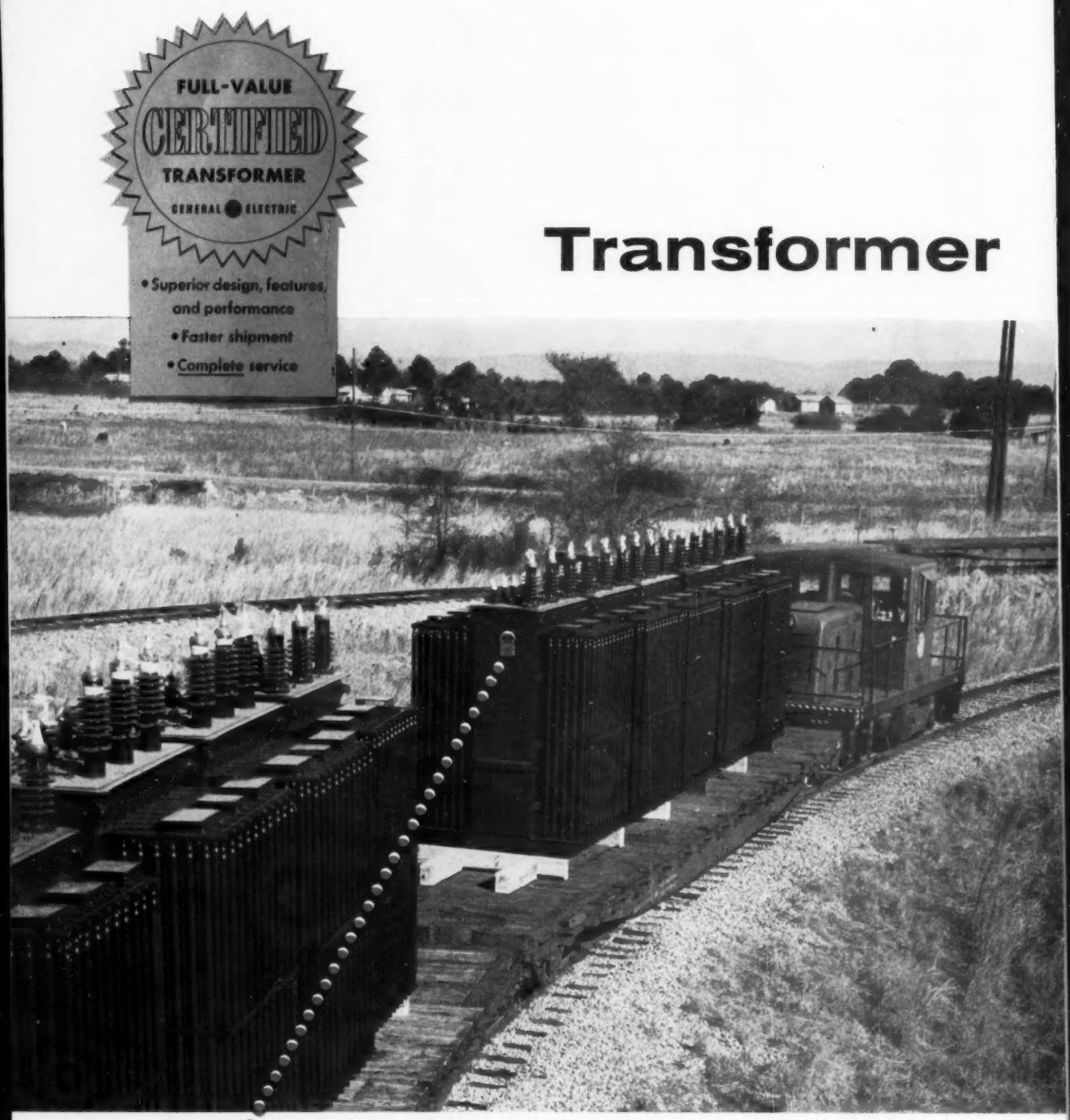
I want to know more about the installation advantages of Republic ELECTRUNITE Electrical Metallic Tubing.

Name_____ Title_____

Firm_____

Address_____

City_____ Zone____ State_____



SYMBOL OF FULL VALUE

With this seal, General Electric certifies full value for your transformer dollar; full value in terms of superior basic design, features, and performance . . . plus faster order handling and shipment . . plus complete service before, during, and after installation. No other transformer manufacturer can match this complete General Electric package.

shipment now 20% faster

Use of digital computer reduces design time; permits faster production, delivery of General Electric medium transformers

Faster product designing—through the use of a digital computer—now makes it possible for General Electric to reduce medium transformer* shipment schedules by as much as 20 percent.

Single-phase and many smaller three-phase units in the 501- to 7500-kva ratings are now shipped in five weeks! No more than six weeks are required for shipment of the largest standard-design three-phase units.

This faster shipment is the result of General Electric's efforts to reduce time spent in transformer design engineering. Normally, 40 hours of engineering are required for preliminary design —*now, with the computer, it takes just 20 minutes!* On final designs, the computer quickly selects proper sizes for all transformer parts—core, winding and tank. Sizes and weights to best meet specifications for a complete transformer and individual parts are computed in minutes. *This reduction in design time and expense is passed on as a direct shipment and product quality benefit to you.*

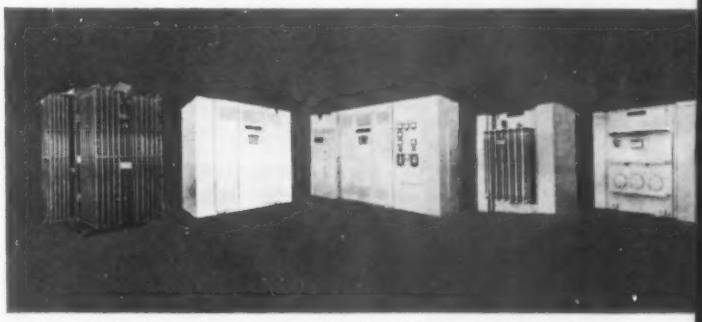
Computer-designed General Electric transformers also feature many basic improvements, including up to 20 percent reduction in height with negligible increase in floor space, and weight reductions up to 8000 pounds.

Ask your G-E Apparatus Sales Engineer to point out the many ways you save time and money with computer-designed transformers—another result of General Electric's *continuing* Certified Full-value Transformer Program. General Electric Company, Schenectady 5, N. Y.

416-30

*501 to 7500 kva, 69 kv and below.

DIGITAL COMPUTER cuts engineering and shipping schedules on G.E. medium transformers, saves customer time and money.



FULL LINE of Full-value Transformers by General Electric—left to right—Medium, Open Dry-type, Integral Distribution Centers, Distribution Equipment and Sealed Dry-type.

Progress Is Our Most Important Product

GENERAL ELECTRIC

SPECIFY CLIFTON CONDUIT

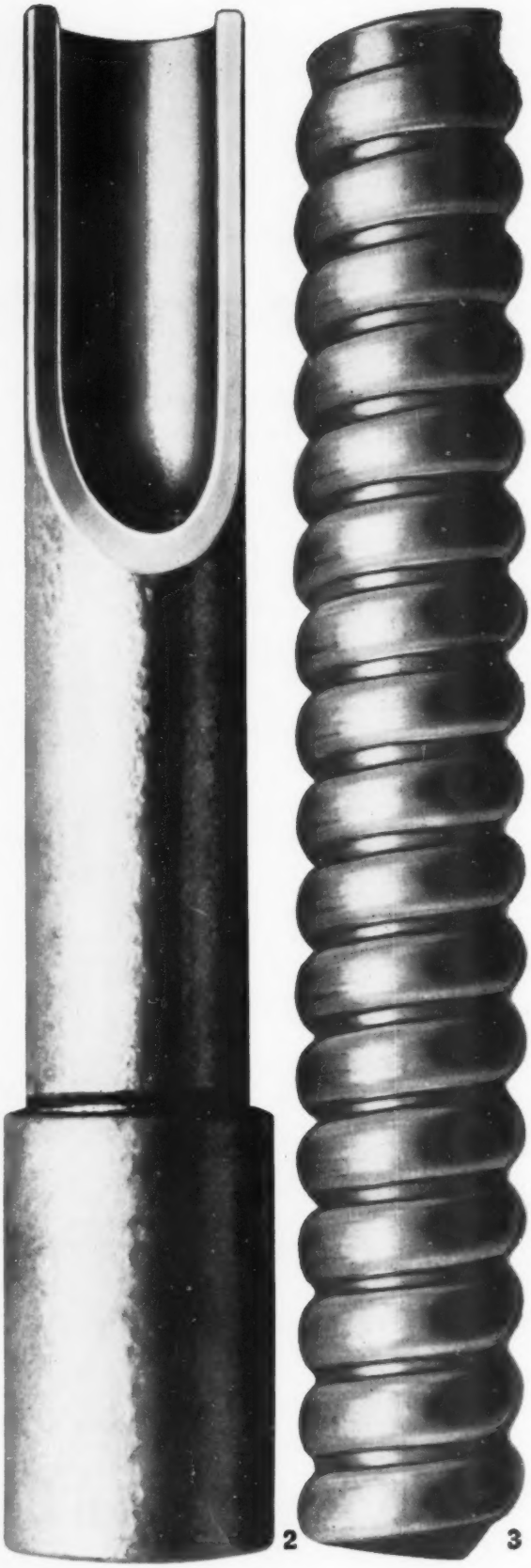
The conduit with built-in quality

1 **EMT** (Electrical Metallic Tubing) the only hot-dipped galvanized tubing—inside and out for complete protection •flat, clean, continuous weld for smooth interior surface and ease of pulling during installation.

2 **RIGID CONDUIT** made of the finest steel available • Clifton's exclusive process for hot-dipped galvanizing guarantees a uniform zinc protective coating ...inside and out • the finest rigid conduit made. Clifton Rigid Conduit is approved by Underwriter's Laboratories, Inc. and conforms with Federal Specification WW-C581C and ASA Specification C-80.1-1953. Clifton EMT is approved by Underwriter's Laboratories, Inc. and conforms with Federal Specification WW-T-806B and ASA Specification C-80.3-1953. RIGID CONDUIT ELBOWS, COUPLINGS, AND NIPPLES in a full range of sizes • are manufactured of the same fine high quality steel as RIGID CONDUIT • hot dipped galvanized inside and out.

3 **FLEXIBLE STEEL CONDUIT** really flexible and crush-resistant for easier and faster installations • manufactured under Clifton's rigid controls from purchase of high quality steel tape to finished product • smooth inside surface assures you trouble free pulling during installation. Clifton Flexible Steel Conduit is approved by Underwriter's Laboratories, Inc. and conforms with Federal Specification WWC-556. Other quality products by Clifton: Bushed Armored Cable; Unarmored Service Entrance Cable; (CLIFTX) Non-Metallic Sheathed Cable; CLIFTALL-UF; Building Wire —TW, RHW, RR.

CLIFTON CONDUIT CORPORATION
A Division of General Cable Corporation
3300 Eastbourne Ave., Baltimore 24, Md.



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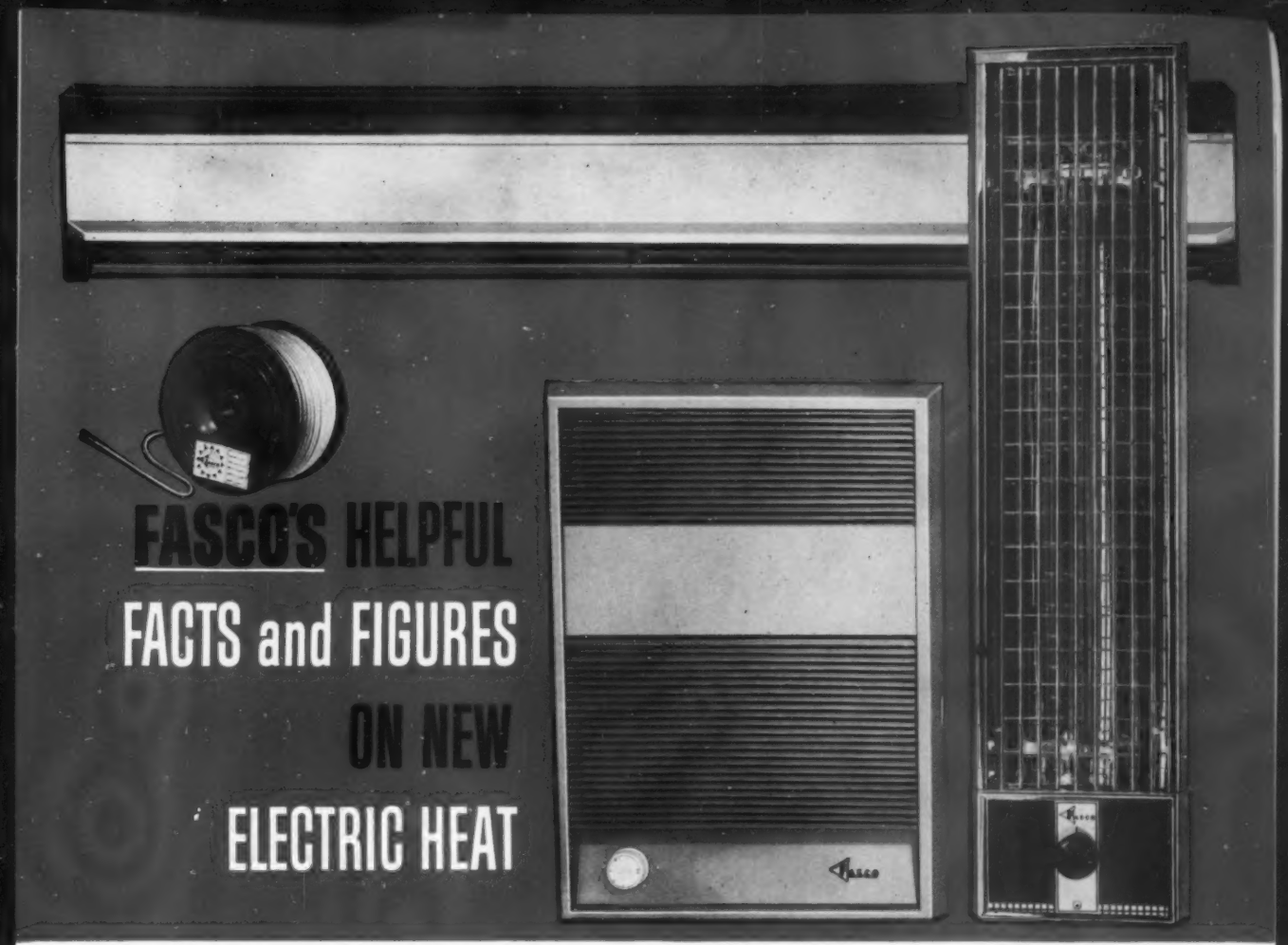


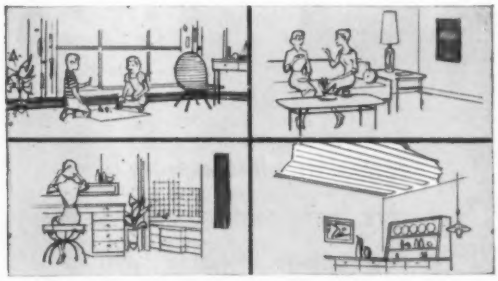
FASCO'S HELPFUL FACTS and FIGURES ON NEW ELECTRIC HEAT

BASEBOARD HEAT
BB-2408

7½" high, 2½" deep in 48" and 32" sections; built-in temperature control; corners, blanks, receptacle sections; removable front panels; ideal where decorative appearance is essential.

FORCED AIR HEATERS
(Models FW-2415, 2420, 2430, 2440)

22⅜" high; 10" wide recessed into wall 4" while protruding into room 1¼"; four wattage sizes in 240 volts, 1500, 2000, 3000, 4000 watts; ideal for basements, recreation rooms, garages, hallways, kitchens and large living areas; baked enamel finish.



RADIANT WALL HEATER
(Models RW-1215, RW-1210)

Features Fasco's "Fast-Glo" element. 32¾" high by 8⅛" wide, recessed 3½" and protrudes ¾" into room; head-to-toe warmth; reaches full operating temperature in several seconds; two sizes — 1500 and 1000 watts; ideal for bathrooms.

RADIANT CABLE
(CC-2250 thru CC-2265)

15 sizes for 240-volt operation ranging from 400 watts (150 feet) to 5000 watts (1820 feet); suitable for use in ceiling of dry wall or plaster, or imbedding in concrete slab; each size color coded, covered with vinyl insulation and tough nylon jacket.

Fasco offers a complete new home-heating combination scientifically designed on a room-by-room basis . . . available as a complete system or for supplementary heat, in baseboard sections, radiant wall insert heaters, forced air wall insert heaters, radiant cable, precise controls and accessories.

This line features the progressive slim-trim styling and practical installation now in demand among heating contractors and builders. Units are 100% efficient, give clean, even heat silently and quickly without drafts.

It will pay you to check into Fasco—easiest heat you ever installed —most satisfying to *your* customers, too!

FULL LINE FOR HOME HEATING BY

FASCO

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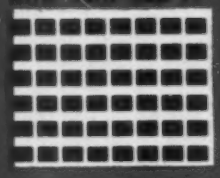

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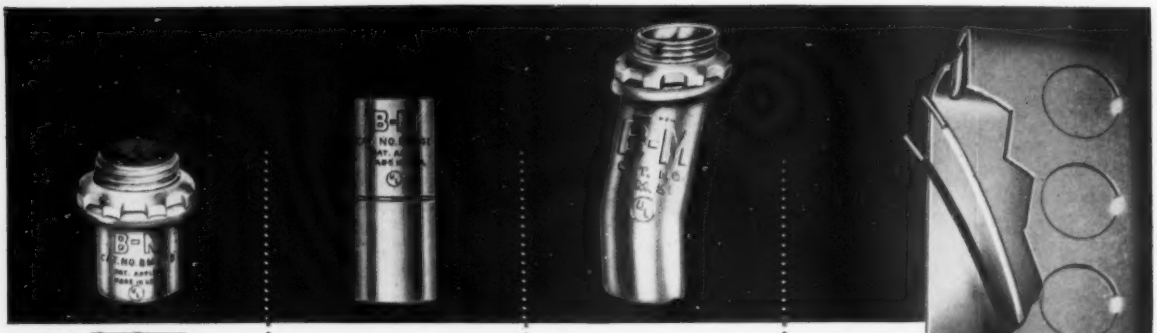

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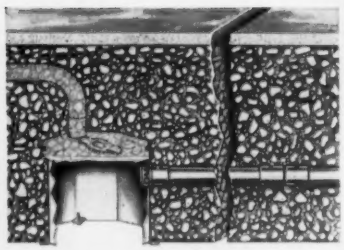

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The Pascagoula-Moss Point Bank features solar controlled louvers for lighting. Here, the left louvers are open; the right ones are closed.

A section of the bank's interior is shown here. Troffer lighting provides 100 footcandles of illumination throughout the building.

Solar control operates bank

By Bill Abbott

This article should be especially helpful to the following readers:

Electrical Contractors ✓
Electrical Utilities ✓
Electrical Wholesalers ✓
Electrical Inspectors ✓
Industrial Engineers ✓
Consulting Engineers ✓

◆ THE ELECTRICAL system of the new million-dollar, four story Pascagoula-Moss Point Bank, Pascagoula, Miss., does just about everything except turn handsprings, and does it automatically.

Crowds at its opening, earlier this year, passed through hydraulically operated doors, breathed high voltage electronically filtered air, enjoyed electrically distributed music, and marveled at a sonar controlled security system and solar timed natural lighting.

These modern devices helped provide a pleasant atmosphere of dignified serenity and efficiency to admiring visitors. To the wiring contractor, however, they were an interesting challenge and a practical example of rapid new developments in electrical engineering and manufacturing. According to Bob Chain, president of Chain Electric Company, Inc., of Hattiesburg, Miss., who did the wiring, the job pointed up to him and his permanent force of 25 the necessity of staying abreast of new designs, materials, methods, and uses.

Hidden cost factors

"Some of these new things have hidden cost factors that a contractor may not have experienced," he explained. "It is going to pay him to know all about them, despite their newness, before he undertakes to bid on their wiring."

The Pascagoula job included wiring for such modern equipment as a television coaxial cable, a sound and music system, and a burglar alarm that is operated manually and also by sonar controls activated by noise near the vaults after business hours.

Also included are hydraulic pedal doors, a large air-conditioning-heating system with high voltage air filters, a solar time controlled natural lighting system and an underfloor electrical distribution system.

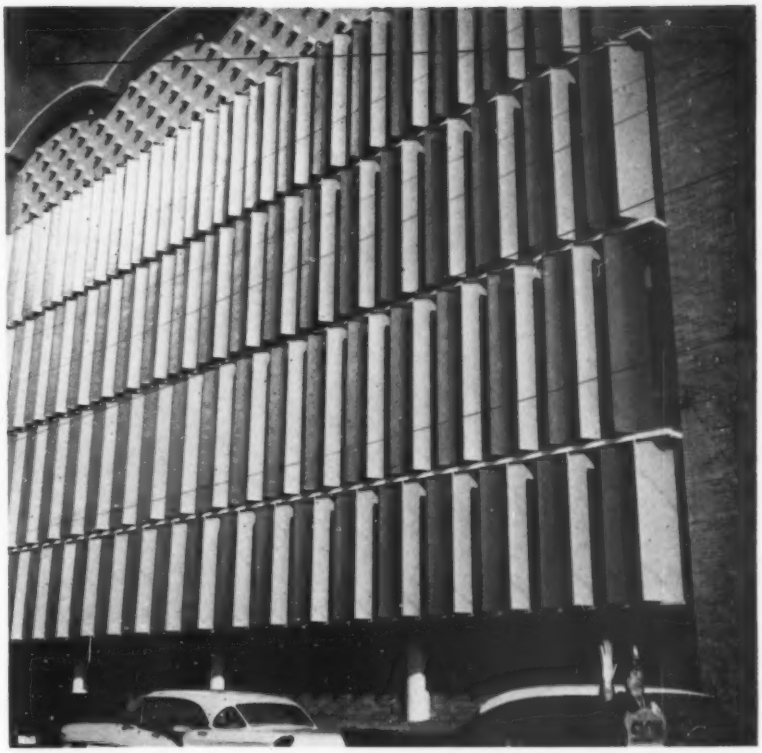
The solar time control lighting system is the most spectacular novelty, consisting of giant louvers or vanes on two sides of the building, east and south, operating from open to closed positions by eight motors, two on each floor. There are two control panels, one for each side. The panels are activated by two photoelectric cell units on the roof, facing the same direction as the louvers they control. Intensity of the sunlight thus regulates the position of the louvers.

"The system looks and sounds fantastic," Mr. Chain said, "but its workings are very simple. Its wiring was merely a routine job. The thing that gave us our biggest problem was the underfloor duct distribution and general wiring."

Underfloor duct system

The underfloor ducts were specified, rather than conduit, to provide around 5,000 outlets, when and if needed at presently unde-

Bob Chain, president of Chain Electric Co., Inc., wiring contractor for Pascagoula-Moss Point Bank.



This detailed view of the louvers on two sides of the bank building shows the louvers or vanes opened out to admit more light. This part of the system is operated by eight motors, two on each floor. There are also two control panels, one for each side.

lighting

termined positions. Nine ducts were installed, totalling 10,000 feet. Outlets were placed every two feet, and about 100,000 feet of wire was used, ranging from No. 14 up to 750 MCM in parallel.

"It is a wonderful installation," said Mr. Chain. "It takes care of long range future outlets, with easy installation of service fittings, without damage to floor coverings of any type.

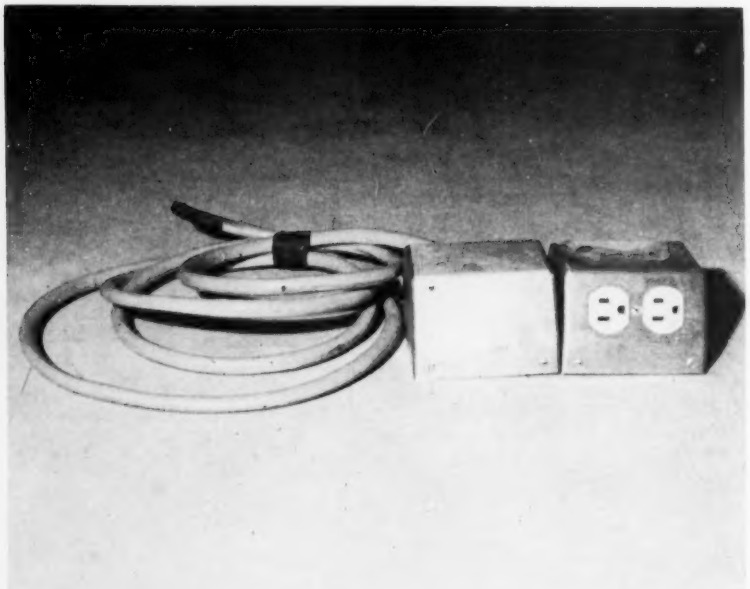
"The difficulty in the initial installation came with trying to keep the ducts straight and level. They were first laid on the foundation concrete slab, then aligned and leveled by shooting a grade and making a chalk line. They were then grouted for the fill.

"This sounds easy, but it isn't. It requires a high degree of skill and supervision for a good job. It is precision work with a very low tolerance of error that can add to labor costs. Don't ever figure it as a hurry-up operation.

"We advise contractors to know their duct, too. Many new kinds are being offered, and it is essential to pick the right duct for the right job. Otherwise, what might

H. O. Burleson, left, foreman, and Chester Moulder, engineer, of Chain Electric Co., examine one of two photoelectric cells atop the bank. The cells face the same direction as the louvers they control. Intensity of sunlight thus regulates louver positions.

The bank's service entrance is for a 4160-volt system with a 2000 ampere bus. The job included wiring for such equipment as a television coaxial cable, a sonar burglar alarm, air conditioning and heating with high voltage air filters, and hydraulic pedal doors.



This is the type fitting used for the bank's underfloor distribution system. Provision was made for ultimate installation of about 5,000 outlets. Nine ducts were installed, totaling 10,000 feet. The housing will accept standard receptacles up to 50 ampere rating.

seem cheap can be expensive in higher labor costs."

The interior of the new bank is 127 by 70 feet. Its service is 4160 volts delta primary to 120/208 volts secondary, with a 2000 ampere bus. Ten branch panels were installed for lighting distribution and eight for telephones, along with a telephone equipment room.

High level lighting

The lighting system was designed to maintain a level of 100 footcandles throughout the four-story building, unusually high for the Gulf Coast area. The fixtures are 2-feet x 4-feet recessed units and different from others of their type in that they were limited to a 3¾-inch over-all depth because of air conditioning ducts and other equipment installed throughout the ceiling area. This quality fixture was difficult to find in an acceptable price range, and 500 were required.

Most of the building has a metal pan type "snap-in" ceiling, so the fixtures were installed merely by placing them in the framed space and pushing them firmly into place, clips on the fixtures snapping onto the ceiling channel.

This ceiling arrangement greatly simplifies future possible changes or rearrangement of lighting.

Throughout the construction period Chain Electric was usually ahead of other non-electrical work and supplies. In the final week the over-all job coasted to its completion date and a widely advertised opening ceremony at which pretty Mary Ann Mobley, Miss America of 1959, year the bank's construction began, was hostess.

Newness is routine

The newness of some of the building's requirements were normal to Chain's crew who have come to expect surprises and the unusual in rapidly changing job specifications for Southern construction.

By coping with these, the Chain organization has grown in five years from a home and rented warehouse enterprise to one covering the entire state of Mississippi. Specializing in industrial, business and institutional contracts, the company has modern offices and headquarters in Hattiesburg. It operates its own four-place airplane and a truck-to-office radio system reaching out 150 miles into its annual million-dollar operation.

Contractors tell how

Electricians working in homes can boost electric heat sales

By Eugene Downs
Downs Electric Service
Silver Spring, Md.

◆ ELECTRIC HEATING is constantly in the forefront of my mind when I am in a residence on a repair or rewiring job. I myself am completely sold on electric heating because it is even, clean, and economical heating—superior in many ways to other means of heating, and requires no maintenance. That is how I came to sell over 25 jobs of electric heating last year as against six jobs the year before.

When I am working in a residence and observe a recreation room, enclosed porch, addition to the house, or see an elderly person who may require rooms of higher temperature than other members of the family, I always inquire about house heating. Is the house uniformly warm? Any rooms that can't seem to get heated adequately?

I try to draw out complaints. Is the elderly person finding his bedroom comfortable? Is the new addition to the house as warm as the rest of the house? Or is it shunned because it seems always chilly in there? Is the small portable electric heater enough for the recreation room? Or does it heat only the immediate area, so that the family is not getting as much use out of their recreation room in the winter as they should?

In setting up a basement recreation room, a household often tries to take heating out of existing heating ducts. Since this may be inadequate because the heating units take care of the upper floors, the problem of heating is raised.

Is gas the best? They have an oil heater now and thought of gas or electric. My first point in selling electric heat is always the evenness of heating and its economy in this area. Gas may be cheaper but initial installation is more expensive. I always stress that at the basic cost I can furnish them additional heat at a very minimum figure. For example if a 2000 watt unit is needed, I can give them an extra 1000 watt for only $50 more. Most customers appreciate this additional at its low cost.

To convince myself that electric heating was inexpensive, I dropped around regularly to homes where I had installed supplementary electric heating in enclosed porches, basement recreation rooms, bedrooms, etc., and checked on monthly bills to learn increase in consumption costs. I was eager to learn whether the difference was very great. Supplementary electric heating for these small areas or rooms often came to no more than an additional $1 per month.

We mention this point in homes where we try to sell supplementary electric heating. We describe the area and amount of heating required, and though these rooms are continuously used, are heated economically.

Satisfied customers have been our best means of promoting supplementary electric heating. We have tried newspapers but did not get the response expected. Of course, the best way to sell elec-

(Continued on page 50)

This bedroom will soon have electrical heating thanks to an alert electrician who informed his client of the advantages in cost and comfort.

Electrical repair jobs may give the cue for talks and advice on electrical heating equipment that the customer formerly knew nothing about.

Summer heat opens new

By Ray Pinkerton

Secretary-Treasurer
Standard Electric Co., Inc.
Wheaton, Md.

This article should be especially helpful to the following readers:

- Electrical Contractors ✓
- Electric Utilities ✓
- Electrical Wholesalers ✓
- Electrical Inspectors ✓
- Industrial Engineers
- Consulting Engineers ✓

◆ WASHINGTON, D. C., summers are universally noted for extreme heat and humidity, adding up to unbearable discomfort—plus new air conditioning problems.

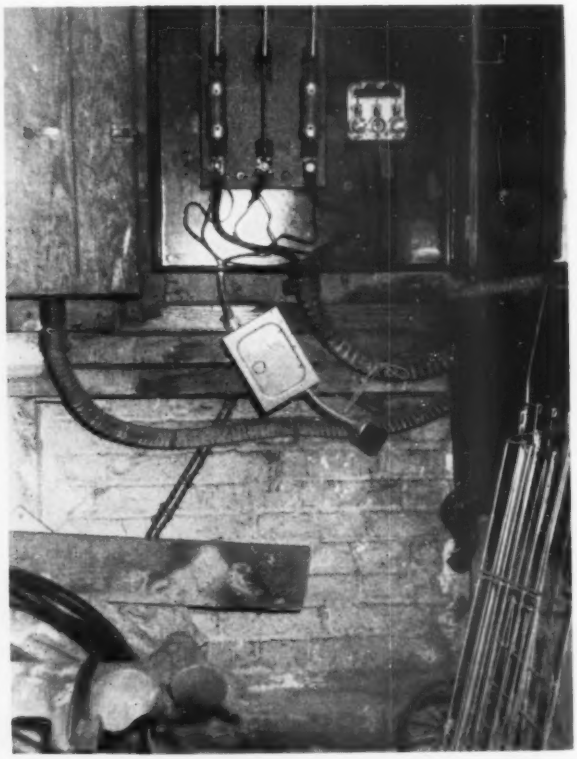
Within the past five to ten years, a large number of luxury and semi-luxury apartments have been built in this area, with central air conditioning. This new development posed a threat to the thousands of apartments, particularly those in the heart of town, which had been built from five to sixty years ago, but in which no provisions had been made for air conditioning or for rewiring.

Since rewiring for central air conditioning would have been economically unfeasible, and in many cases physically impossible, the emphasis was for rewiring for installation of special air conditioning outlets for use of window units.

Every individual building represented a particular problem based primarily on the method of the original installation, the physical structure of the building, and the demand of the builder. One of the important factors was that while providing for the requirements of the particular job, we had to do the work in a manner that would create the absolute minimum of inconvenience and discomfort to tenants, and cause only a minimum of damage to the building, apartments, furniture, and furnishings. Most important was to install pipes, boxes, panels, etc. inconspicuously.

One particular building, about 50 years old, may serve as a general illustration of the work, since the electrical rewiring was quite complicated and included almost all the problems mentioned above.

This scene shows a Washington apartment building before the rewiring installation was begun by Standard Electric Co. Note the hanging deteriorated wires, which created their own fire hazard in the area.



Another scene, before rewiring took place, shows the open knife switches with hanging and deteriorated wires. Inadequate current had been provided here, and the equipment was in a poor location.

rewiring opportunities

The original service was 400 amperes, which had to be heavied up to 2 - 4000 amperes. This meant additional room for the increased service equipment. The original installation was based on individual meters for each of 132 apartments and since it was a six-story building with runs, of some 200 feet, conduits were to be run from the service to each apartment in many cases.

Panel problems

Some time after the building was constructed, the individual meters had been blanked up and a master meter installed. But the old wooden panel boards still included the old meter boxes with the exposed wiring. These had to be removed, new panel boards installed in their places and circuit breaker panels controlling each apartment built on them.

The major problems were: (1) the removal of the existing feeders from the apartment, conduits, in most cases no larger than two-#14 conductors, and (2) their replacement with three-#8 conductors, a size adequate enough for two air conditioning units not exceeding 3/4 hp as well as the load of the apartment based on the present Code.

Where the original installation included a two circuit fuse panel in the apartment, this was replaced with a six circuit circuit breaker panel. In this particular case, it was mounted on the surface of the old panel, which had its insides removed and which served as a junction box.

Conduit needed

While most of the outlets in the apartments had been wired in conduit, some were not. We replaced the existing wire in the branch circuits while adding the air conditioning circuits in the same conduits and usually terminated at the outlet (light, switch, or plug) nearest the window where the new air conditioning outlet would be installed. This run would be made in surface molding, and usually being short would not be too conspicuous, particularly if it was

(Continued on page 146)

Service was increased from 400 to 4000 amperes in this apartment house. Each panel controls two of the building's eight units.

Wires were pulled 200-feet through existing ½-inch pipe for this eight sub-panel heavy-up, giving a fivefold increase in amperes.

Application problems occupy Southwestern IES conference

By Bob King

This article should be especially helpful to the following readers:

- Electrical Contractors ✓
- Electrical Utilities ✓
- Electrical Wholesalers ✓
- Electrical Inspectors ✓
- Industrial Engineers ✓
- Consulting Engineers ✓

◆ SOUTHWEST MEMBERS of the Illuminating Engineering Society, 125 of them, along with 52 wives, met in Corpus Christi, Texas, recently for their annual Southwestern Regional Conference.

First day of the meeting, Sunday, was also a day of recreation for most of the IES members who arrived early in the Gulf resort city to enjoy a day of deep sea fishing, golf and a boat trip on Corpus Christi bay, followed by the president's reception held that evening at the Robert Driskoll Hotel honoring visiting IES national president, John B. Browder.

The conference officially convened the following day beginning with a welcoming address by John Deck, southwestern regional vice-president and J. L. Bates, president of Central Power and Light Company, Corpus Christi, who welcomed IES members to the city.

Speaking first at Monday's technical session was John S. Haney, illumination sales manager for Crouse-Hinds Company, Syracuse, N. Y. Haney discussed "Floodlighting for Today and Tomorrow," and spoke of the work being done by the IES technical committees and of the recommended types of floodlights for many different lighting tasks.

Haney said that IES and NEMA have done much to standardize floodlighting classifications and types and are now working on standards for mercury floodlights. He also said that we are seeing more and more methods of lighting the outdoors, such as baseball diamonds, football fields and other large areas. When more economical, he predicted lighting of golf courses and other large areas of this nature.

He listed the five major uses of floodlighting as (1) for advertising, (2) for selling, (3) for work, (4) for protection, and (5) for recreation. Illustrating the talk with a series of colored slides, Haney told of floodlights of the past, present, and what may be expected in the future. It was his opinion that great strides have been made in the field of color floodlighting for business establishments and other applications, and that this will increase extensively in the future.

The second technical session beginning that afternoon was under the direction of Don Madden, chairman. A panel discussion was held with architects C. P. Donnelly, Joe G. Smyth, and Walter E. Wilde, as panel members who answered questions from IES members.

Two highlights of the conference were the panel discussion featuring three architects and the address of the IES president, Joe B. Browder, of Atlanta. Above, left to right, are Don Madden, moderator of the panel and chairman of the Ark-La-Tex Chapter, Joe G. Smyth, C. P. Donnelly, and Walter E. Wilde, all members of AIA. At right, Joe B. Browder, national president of IES.

Question: How does artificial lighting affect architectural design today?

Mr. Donnelly: Since architects are turning more toward artificial lighting, it is affecting design more than ever. We are also realizing that we should work more closely with illuminating engineers in this regard, since I know from my own personal experience that often I have turned over the problem of lighting and installing fixtures in a building to an electrical contractor and then have been disappointed with the results. We should have retained an illuminating engineer to help us with our lighting problems.

Mr. Smyth: The problem of selecting the fixtures to coordinate with the job is our biggest problem, that is; to select the type of fixtures to complement the design and still stay within the budget. I would like to add a note here that it would be appreciated if lighting company representatives would not bring in experimental fixtures that are not on the market and not available. I have had the experience of ordering a new type of fixture, then finding that it was not yet on the market. If the fixture is controversial in its result, we would appreciate knowing it.

Question: In what way does color in illumination affect design?

Mr. Wilde: It affects it in many ways. It usually helps to have the illumination as near natural daylight as possible. True white light does not usually affect most materials. However, we once had a case in which we used cool white light in a building with red marble and found that the light turned the color of the marble a brown shade. Presently, the special lighting effects brought about by colored lighting is becoming increasingly important in interior design.

In answer to other questions, members of the panel suggested that IES along with lighting fixture manufacturers consider pooling their efforts to publish a volume of current lighting and fixture techniques and listing physical dimensions and other statistics in the hope that it would take the place of the large volume of mail that now comes to the architect such as brochures, folders and other material they claimed becomes lost, misplaced, or thrown away.

They voiced the need for more technical information as to placing of fixtures in buildings, perhaps with exhibits of fixtures with interior and exterior mountings. In such a way, the architect would have a place to come and look at the fixtures, which, they maintained, would be better than the illuminating engineer coming to their office all the time.

Also on the afternoon session were representatives of the Benjamin company. B. S. Benson, Jr., director of research and development, gave a demonstration of combined lighting and air conditioning installations. The two men discussed the problems that are being overcome by improved systems and ducts in air circulation control.

The demonstration showed the use of ducts to adjust and pull heat out of a room thus cutting down on the amount of air conditioning necessary. In the winter, the heat from light bulbs is drawn into the ducts and redistributed throughout the room. Such a system is in use in the central offices of Central Power and Light Company, in Corpus Christi.

At the third session, R. W. Gow, chairman, introduced the first speaker, W. P. Lowell, sales manager for Sylvania Electrical Products, Inc., who told of "Roadway Lighting at Home and Abroad."

Lowell used a series of colored slides to show examples of lighting techniques for streets and boulevards in foreign countries, including the Soviet Union.

Commenting that although many of the boulevards and speedways in Russia are often well lighted, usually with incandescent lamps, they do not bother to maintain the equipment. Often the lights are never cleaned at all. Most of the

(Continued on page 145)

Featured speakers at the conference were, left to right: B. S. Benson, Jr., director of research and development, Benjamin Div., Thomas Industries; W. E. Folsom, commercial sales manager, Dallas Power and Light Co.; J. L. Bates, president of Central Power and Light Co., who welcomed the IES members to Corpus Christi; and John B. Deck, of Texas Power and Light Co., IES Southwestern region vice-president.

Quality lighting and architectural precision are immediately apparent in this illuminated ceiling in the Berkshire Life Insurance Co., providing 80 footcandles, but featuring low brightness.

Illuminated ceiling balances control of light, heat, cooling, and acoustics

This article should be especially helpful to the following readers:

- Electrical Contractors ✓
- Electric Utilities ✓
- Electrical Wholesalers ✓
- Electrical Inspectors ✓
- Industrial Engineers ✓
- Consulting Engineers ✓

◆ ILLUMINATED ceilings are generally designed for uniform lighting, but few are required to also give structural support to an elaborate acoustical system, provide room for the air-conditioning and heating outlets, and at the same time create low brightness and a complete absence of specular reflection. This was the problem Smithcraft Lighting-Ceiling recently solved for the home office of the Berkshire Life Insurance Co.

The completed system gives an unusual uniformity of illumination. Extensive readings at widely scattered points throughout the building show only a minor variation in footcandles anywhere under the system. Low brightness and an absence of specular reflection are achieved by a double shielding arrangement of Cubex with half-inch openings, used with matte-white finished aluminum louvers on the lower grid and light sources covered by a semi-circular plastic shield above the grid. From no point, even from directly below looking straight up, are lamps visible.

The white acoustical baffles also act as reflectors within the illumination cavity. Within this cavity, lighting is extremely uniform, with no contrast or shadows. Before Smithcraft finally froze the design of the system, the relationship of the lamps and the lower and upper diffusers, as well as the angle of the acoustical reflectors, were carefully studied and tested in a seven-square-foot mock-up optimum positioning. This mock-up, incidentally, was located in a mirrored corner so that the effect of an expanse of ceiling could be studied.

The lighting system uses approximately 2,500 two-lamp fixtures, which in turn use 5,000 three-foot warm white rapid-start lamps. Approximately 80 footcandles are maintained. The Cubex aluminum louvers are finished in matte-white to provide 45 by 45-degree shielding. They are sup-

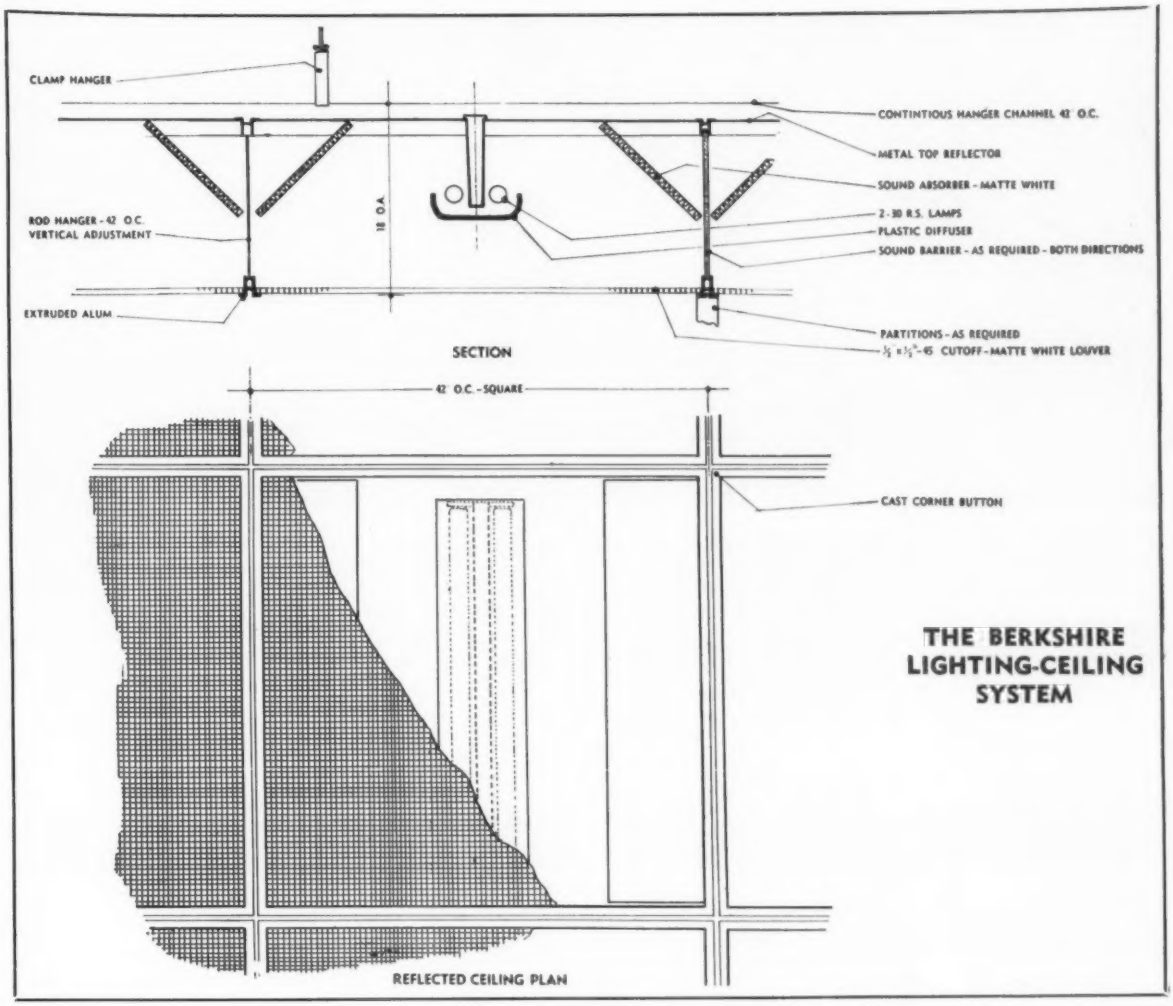


Diagram showing relative positioning of the various structural parts of the illuminated ceiling.

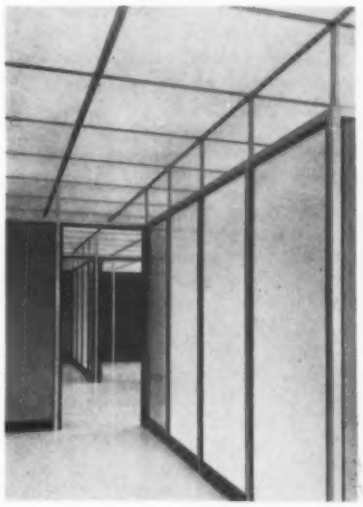
ported on specially designed anodized extruded aluminum runners.

A requirement of the acoustical design of the system was the need for providing sound correction in the busy, general office work areas of the office, and for setting up sound barriers between private office. Smithcraft's lighting design provided support for such an acoustical system.

Heavy Fibreglas sound absorbing pieces also act as light reflectors, while the sound barriers are of a heavy gypsum base with a matte-white finish on the exteriors, and are gasketed on all four sides with white rubber. At the wall, the ceiling fits precisely, with gasketing to assure a perfect fit and thus efficient sound barriers.

The office building was designed on a module of 42-inches. The modules of the lighting system not only conform to this design, but provide structural headers for movable sound partitions, which can be firmly anchored to the ceiling on any or all of the 42-inch intersecting lines. The lighting system has been designed to "breath" horizontally. Each module is horizontally adjustable. By rotating a screw, one can move the intersection point in any of four directions.

In addition, the lighting system is adjustable upwards or downwards at all modular lines, so that compensation for over-loading on the floors above may be made, and the ceiling will stay precisely level. This adjustment is made by rotating a hanger rod.



The ceiling also provides structural header support for the whole system of movable partitions.

Modern type architecture also provides numerous opportunities for use of low voltage remote control. In many instances, this new method is not only less expensive—the job may be impossible of accomplishment without the advantages it offers. This school with its brickcrete walls, laminated wood supporting arches, and tongue-and-groove roof decking could hardly have been wired by any other method. Shallow grooves in the wood arches, decking and brickcrete sections were satisfactory for small low voltage control wires but could never have been made large enough for conventional raceways.

Industrial and commercial use

By Harry J. Miller

This article should be especially helpful to the following readers:

- Electrical Contractors ✓
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- Electrical Wholesalers ✓
- Electrical Inspectors ✓
- Industrial Engineers ✓
- Consulting Engineers ✓

◆ "By OPENING UP entirely new concepts in the field of switching, low voltage remote control systems present the electrical contractor with a ready-made sales tool in soliciting commercial and industrial applications for this versatile and flexible system," reports Kenneth Brumbaugh, electrical engineer, of Sarasota, Fla.

"Circuitry is possible where its attempted counterpart with conventional wiring would not only be too complex and costly, but, in the case of some of today's expensive and modernistic homes and industrial buildings, would be entirely out of the question.

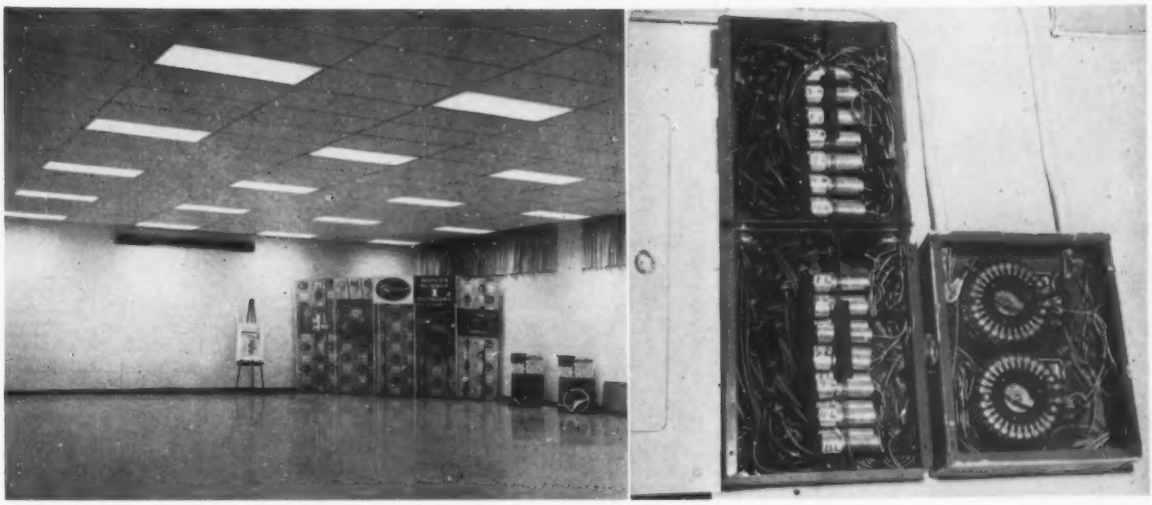
"For example, one school we wired had a wooden tongue and groove roof deck of which one side constituted the finished, exposed ceiling. Brickcrete ran 6 feet, 8 inches up from floor level, and this was followed to the ceiling with glass. Laminated wooden arches ran up the wall and across the ceiling as supporting units. The architect would countenance no exposed wiring or surface mounting of switches, and to groove the arches deep enough to install conduit would have sapped their structural strength, so this was out of the question.

"There was only one answer—the small wires of low-voltage remote control. Shallow grooves were made in the woodwork; the #18's were imbedded there, as they were in the brickcrete which carried the slender switch legs.

"In one electronics plant we wired, there was some uncertainty as to whether or not the first buildings erected were to be temporary or permanent structures, since the company did not know for sure just how much space it required for its operations. Our job then was to install a temporary system.

"We used low-voltage remote control switching in this installation. Later, it was decided to retain the buildings as permanent office space, and this meant the revamping of the wiring. It surely was a lot easier and cheaper to move and rearrange the low-voltage wiring than would have been the case had conventional wiring been installed in the first place.

"There is great need to reevaluate wiring methods in the light of the structural components that come off architects' drawing boards. A sliding door in a house leaves very little room in which to install conduits. Entire walls of glass between a living room and patio are frequently used. In each case, it is usually desirable to have a switching point at the entrance to the room. The conventional system requiring a run of conduit down a 4-inch stud which can pose an unsolvable installation problem. With the low-volt-



Industrial installations with complex switching requirements provide a good opportunity for profitable application of low voltage remote control wiring. An example is this installation for an outboard engine manufacturer. Lighting for a 70-foot long room had to be controllable at either of two entrances, and in two steps to provide either 50 or 100 footcandles. What would have been a complicated and expensive installation was accomplished easily with the electrical masters and relay gangs shown at right which control 400 40-watt fluorescent lamps connected to give 50 or 100 footcandles.

# of low voltage remote control

age system, the small wires can easily be run from outlet boxes to control switches, and in homes or commercial buildings where burglar alarm or watchman's systems are installed, low-voltage components simplify the task and make it more economical and practically feasible.

"This is especially true in the case of multi-point control required, or where the use of electrically operated master switches are specified.

"For the architect and engineer, low voltage systems offer the practical means of fitting wiring into, and concealing them in, the most cramped structural areas."

Shallow surface-mounted switches are common to the low-voltage installations, and they permit mounting on solid partitions, within thin-walled units, on desks, and atop metal wall framings, etc.

Engineer Brumbaugh points out that in industrial lighting, low voltage systems offer an infinite variety of remote control possibilities notable for their use with relatively inexpensive switching. In the case of multi-control wiring for office buildings, for example, in original installations there are savings of copper and installation costs; when remodeling work or relocating of switches is required, this is no more complex than relocating a telephone.

Aside from its greater flexibility permitting practical multi-point and master control, such low-voltage arrangements reduce power losses in switch loops and assure the greater efficiency of higher voltage. On the other hand, they eliminate higher voltage at switch points.

Since office-building operators rely on rentals, relocating or rearranging an office for a tenant, so far as the electrical work is concerned, takes little time with a low voltage system, which thus increases per cent occupancy. Where control requirements are extensive they needn't be expensive, since switches and low-voltage relays and units are readily moved, while the wiring does not need to be removed when partitions are re-arranged. The wiring is simply disconnected at partition joints and re-connected at the new locations—all with minimal expense.

In the wiring of schools, the economy and ease of installation of low-voltage systems is particularly striking, and multi-control offers many advantages which the electrical engineer can incorporate in school specifications.

For example, master control and lock out circuits can be used effectively in a principal's office to control hall and classroom lighting. In the low-voltage design, the lock out circuit is simply an additional switch and relay placed in the circuit so as to open "common" leads to local switches, which in turn, makes them inoperative. Thus under this condition, the master station retains control until the lock-out is released.

A master control station is the particular feature required by hospitals and other public institutions, where control of lighting for certain vital areas is imperative and must be under strict supervi-

sion. Multi-point control is also desirable to permit control of light or power according to the requirements of individuals, while still under control of those in authority.

Burglar and fire alarm protection goes hand in hand with low-voltage systems.

Low voltage units are especially adaptable for selective control of lighting in gymnasiums, meeting halls, churches, warehouses, etc. In motels, besides providing bedside control of lights and TV, remote controlled switches can be used to make sure that non-occupied rooms are switched off, and to save the legwork required for switching off signs, outdoors lighting, and the like.

However, next to safety provided by low voltage, the most outstanding feature is not the economy in installation cost, but the flexibility and versatility not commonly associated with conventional switching systems.

"Electrical engineers have always recognized the basic economies that can be obtained through the use of higher voltages and the resultant lower current densities for the same kva load," says Brumbaugh. "In the case of lighting, filament lamps must be used with the specified voltage, thus limiting the branch circuit voltage to 115-120 volts. But there are many advantages in industrial installations of fluorescent lighting in using the 277 volts obtained from phase to neutral in the 480Y/277-volt, 3-phase, 4-wire distribution system. Since the makers of low-voltage remote control components multi-control relays with Underwriters' Laboratories listing for 277 volts a-c, these provide the means of control of this higher voltage."

Low voltage advantage

Obviously, with higher voltage distribution, four wires can be used for three branch circuits, thus effecting additional savings of copper and installation costs attractive to the contractor and his client. An important feature of such installations is the relatively low 6 to 24 volts at switch levels instead of 277 volts.

For example, the 24-volt multi-control relay marketed by one manufacturer (Bryant) is listed by Underwriters' Laboratories for ratings of 1 hp, 15 amperes, 125 volts a-c, or 10 amperes, 277 volts a-c and is suitable for use either with tungsten or fluorescent lamp loads without derating. (Other relays (GE) are available with ratings of 20 amperes, 115 volts a-c, or 20 amperes, 277 volts a-c.)

The actual switching of the 277 volts circuit is accomplished by this relay, which is installed in the box of the outlet it controls, or in gang boxes for the gang method of relay mounting. A prime advantage of these relays is that they mount in most standard outlet boxes having ½-inch of 3/4-inch knockouts.

High bay lighting in industrial applications can be controlled with low-voltage switching that is far cheaper and less complex than when installed in conventional fashion. During non-productive intervals, department supervisors, from remote control stations, can switch off specific lights and circuits.

Electrical Contractor Bill Terrell, of Sarasota, cites his experience when he made a $30,000 wiring installation at the new local plant of an outboard engine manufacturer.

"Our job was to provide a shadow-free lighting system using fluorescent fixtures set above egg-crated-type louvers on a suspended ceiling," said Mr. Terrell, "with the fixtures so arranged that they could be removed and set up above ceiling panels at any point where a concentration of light was needed, as for instance, when desks were moved to new locations.

"Four hundred 40-watt lamps were used, and it was required that they could be switched on to provide either 50 or 100 footcandles at any time, from a pair of switches at either entrance door to a 70-foot-long room. One switch connected the circuitry for 50 footcandle illumination, while flipping the second switch at either door turned on the lights to give a total of 100 footcandles.

"Each fixture had four lamps, and these were hooked up so that the two outside lamps and the two inside lamps comprised two separate circuits for each fixture. In addition, a time lag was required to relieve the line surge caused by throwing all the lights on at once.

"We decided on a low-voltage system, because the numerous circuits, the length of the area, and the controls for two level lighting from two distant points would have meant increased complexity and cost with conventional wiring.

"With conventional wiring, this would have meant consideration of a heavy surge of line current; heavier lighting contractors; expensive holding coils and momentary contact switches, and, since this was a most modern and beautiful building, conventional controls which look industrial and aren't dressed up like low voltage units, were counted esthetically undesirable.

"With low-voltage units we were able to install a system in keeping with the environment; numerous and more expensive conduit or EMT runs were eliminated; and we got away from the complexity and multiplicity of circuits we'd have been forced to use with conventional wiring."

Bulletins on remote control

Readers are invited to use the postage-paid inquiry card on page 17 to obtain copies of any or all of the following bulletins, manuals, and catalogs on low voltage remote control switching devices:

Bryant Low Voltage Multi-Control Wiring System Manual	**Write in S-601**
General Electric Technician's Manual on Remote Control Wiring	**Write in S-602**
General Electric Catalog of Remote Control Wiring Components	**Write in S-603**
G-E Bulletin "How Modern Wiring Helps Sell Houses Fast"	**Write in S-604**
Remcon Electricians' Manual on Remote Control Switching	**Write in S-605**
Remcon Catalog of Remote Control Switching Components	**Write in S-606**
Remcon Reprints of Remote Control Switching Applications	**Write in S-607**
Touchplate's Selected Literature on Remote Control Switching	**Write in S-608**

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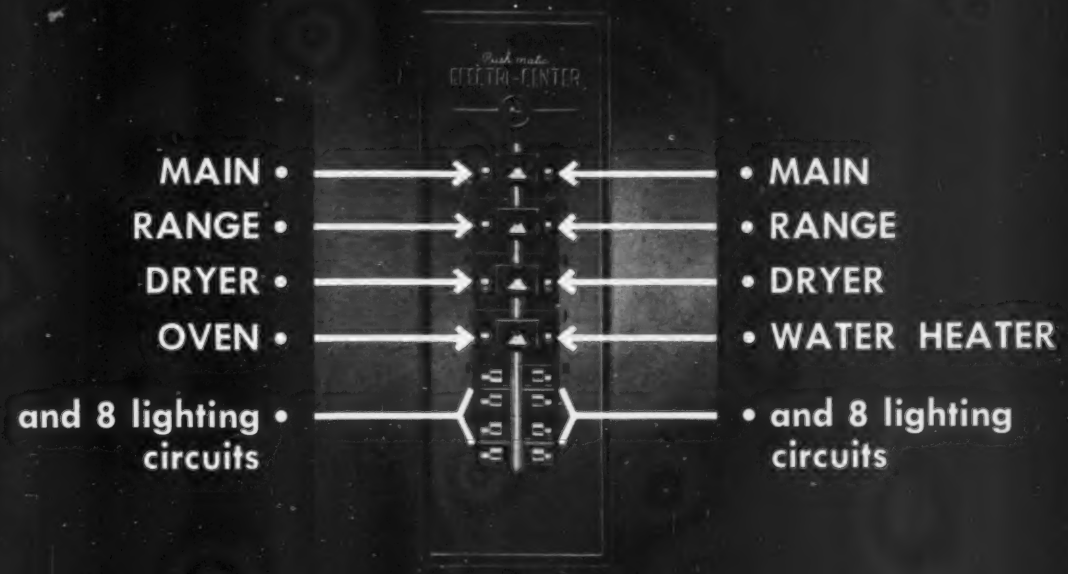
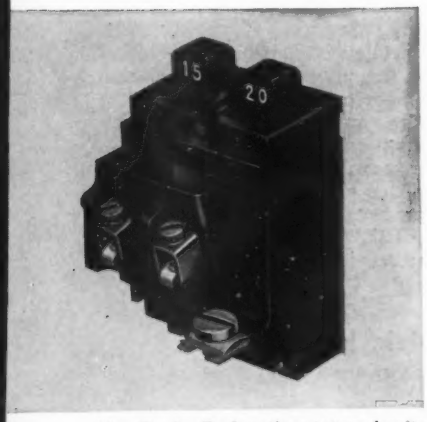


ONLY IN BULLDOG'S 12-CIRCUIT ELECTRI-CENTER®

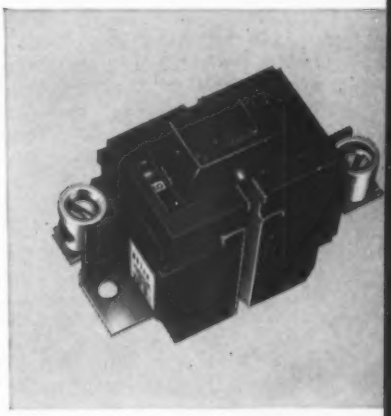


New Duplex Pushmatic puts two circuits in the space of one single breaker. Gives: identical, independent coil-magnetic protection in each pole of all Duplex breakers; positive one-bolt connection; pushbutton convenience.

Only BullDog Pushmatic circuit breakers give you both of the above combinations—plus many others—in a 12-circuit panel. Other breakers would need a 16-circuit panel.

The BullDog Pushmatic® 100-amp breaker takes only two spaces, compared to the four spaces needed for any competitive 100-amp breaker. And new BullDog Duplex Pushmatic puts two lighting circuits in a single space. Count 'em . . . all the circuits shown in only 12 spaces!

You save space by using smaller panels. You provide the maximum in electrical circuit flexibility and protection. Pushmatic protects two ways—coil short-circuit and thermal overload protection. To put more electrical services into less space, see your BullDog products representative.



Pushmatic 100-amp breakers take only two spaces compared with four spaces required for all competitive 100-amp breakers. Pushmatic 100-amp breakers are now available for field installation.

BullDog Electric Products Division, I-T-E Circuit Breaker Company, Box 177, Detroit 32, Michigan. In Canada: 80 Clayson Rd., Toronto, Ont. Export Division: 13 East 40th St., New York 16, N. Y.

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I-T-E CIRCUIT BREAKER COMPANY

Consult the following Southern representatives:

Wilson Electrical Equipment Co.
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Houston, Texas

Wilson Electrical Equipment Co.
101 E. Maple Street
San Antonio, Texas

Standard Electric Mfg. Company
2401 Federal St., P.O. Box 1138
Dallas 1, Texas

Walker Electrical Co., Inc.
125 Bennett St., N.W., P.O. Box 2308, Station D
Atlanta, Georgia

Paul Patton, left, instructor for the Amarillo Electrical Joint Apprenticeship Program with a typical group of apprentices. Classes have grown in size with 31 scheduled to start the next term.

Program provides trained men

◆ RATED as one of the outstanding programs in the nation, the Amarillo Electrical Joint Apprenticeship Program is an excellent example of how cooperation between contractors and the union can reap big dividends.

The apprentice and training program was established in Amarillo in 1946, but it was four years later before it actually began to function efficiently. Until that time the contractors did not participate in the program, and some members themselves, unable to visualize the electrical industry as a growing one which would eventually have more jobs than men to fill them, were reluctant to train new men, according to John Burt, director of apprenticeship and also assistant manager of Local 602, IBEW.

Now, the program is under the supervision of a joint apprenticeship and training committee composed of three electrical contractors and three union members. Elmo Duke, of Duke Electric Co., is the present chairman, and other members are Earl Potter, of Amarillo Electric Co., (he is president of the Panhandle Chapter of NECA), Jack Poynter, of Crown Electric Co., and representing the union, Buford Estes, president of Local 602, J. R. Brown, and James A. Carver.

The committee has full and complete control of the apprentice program.

"The fellows have done a lot of work in this program," says Burt. "The national organizations rate the Amarillo program one of the tops in the country. It takes a good committee to make such a program succeed, and we've got one—men who are interested in bettering the industry. We've been lucky also to get some good instructors.

"Before 1950 the program was run kind of haphazard," Burt explains. "There wasn't much real interest in it at that time. The way I look at it, everybody's business winds up as nobody's business—you need leaders in an effective program."

Apprentice program rules

The Amarillo program is a strong one because of several "musts" that are enforced by the joint committee:

Apprentices must attend classes. The compulsory school work consists of four hours instruction, one night a week at the union hall by the apprentice instructor. If an apprentice does not attend the classes regularly or gets behind on his work on the job, he does not get the usual automatic pay increases.

The four-year training program is divided into eight six-weeks periods beginning May 1 and November 1; the pay increases for on-the-job training are made at the beginning of these periods, provided the apprentice is keeping up with both school and job training.

If a man misses three classes, he is automaticaly suspended and must come before the committee to be re-instated.

Apprentices must be between 18-25 years old, have a high school diploma or the equivalent of a high school education, be in good health and "want to make a good wire man."

The program is not restricted to relatives of electrical workers.

"It costs some money to train a good wireman," says Burt. "We try to choose the kind of young fellow we think will turn out good for the industry."

And the majority of the Amarillo-trained men have turned out to be leaders in their field, he reports. "Some who graduated just a year or so ago now are out running jobs," says Burt. "We've had very few disappointments."

Each year an outstanding apprentice and the instructor are sent to the Southern States Apprenticeship Conference. Paul Patton, the present apprentice instructor, and 22-year-old R. K. Deckard, attended the conference in July, at Charleston, S. C.

Since 1950, some 60 men have been graduated from the Amarillo training program. Currently, 31 are enrolled, and classes, which follow the public school schedule, will begin on September 14th.

Under an agreement between the union and contractors, the employer pays one half of one per cent of his gross labor payroll paid to members of the inside branch of the IBEW toward financing the apprentice training program.

Electric heat sales

(Continued from page 39)

tric heating is, as I mentioned above, bringing it to a customer's attention when you are in his home on a repair, rewiring, or appliance installation, and get to talking about home heating.

Making use of your opportunity is the way to build volume. If a homeowner starts complaining that the house just never seems to get warmed up enough, then your opportunity is readymade.

In America, You Can Own a Water Tower

(The following is the response given by Murray Reiter, president, at the dedication ceremonies of the new Light & Power Utilities Corp. plant in Olive Branch, Miss., on May 21, 1960.)

Distinguished guests, ladies and gentlemen. . . Several of you have heard me mention recently a boyhood dream of mine — to own a water tower of my own! A look around these grounds will show you that this dream has come true. I have my water tower. . . though I must confess it will only be used in case of fire.

But this water tower is not the only symbol of boyhood dreams come true. It is not even merely MY symbol. Rather, it is a symbol that in America a boy can still dream. . . and his dreams can still come true.

All of you here are in a sense symbols. You come to recognize and honor not an individual. . . but a way of life. It is positively thrilling to me to see this new plant, and to think back to the time — only 14 years ago — when the entire L & P organization was a secretary, two production people, and myself. In all the wailing and moaning you hear these days about how America has become soft and complacent, don't forget that little companies like ours are growing and expanding every day. . . all over the country. . . giving the lie to Khrushchev's boast that he will "bury capitalism."

Plants like ours don't grow like Jack's beanstalk. They grow from the united efforts of *people*. . . people like you who are gathered here today. May I offer the warmest kind of welcome to you all. . . and thank you sincerely for coming.

GOLD...

right under our Noses?

by **MURRAY REITER**

More and more it seems to me that a lot of us — electrical contractors, engineers, architects, jobbers and manufacturers alike — are missing a gold mine that is right under our nose.

I'm referring to buildings that are more than two or three years old. Whether they be industrial plants, office buildings, stores, schools or what have you, they are prime prospects for an improved lighting installation. Our lighting industry has made such remarkable progress in the last several years that we can conservatively say that anywhere from 70 to 90% of these older buildings would profit from improved lighting.

What do we do about this gold mine? We go prospecting . . . to find these buildings. And then we go digging . . . to discover what we can do for them. We survey their present lighting facilities. We make specific recommendations — and point out how these improvements will pay off in increased efficiency, safety, and economy in their own operations.

Often enough (we've found from experience) this prospecting and digging pays off in a direct sale. "We", in this case, are manufacturers of fluorescent and incandescent lighting fixtures. We offer this "prospecting" and "digging" service to our customers without charge. But I'd like to suggest that YOU — whether electrical contractor, engineer, architect or jobber — can do the same prospecting for yourself.

Our lighting industry is in for a tremendous growth in the next decade, I believe. But this growth can be doubled, tripled perhaps, if we accelerate it by our own ingenuity and effort. Truly modern lighting fixtures are an obvious need for NEW buildings. They should be just as obvious a need for old ones.

Yes, there's plenty of gold . . . right under our nose. If you'd like further details on how we mine that gold at L & P, just drop me a line, c/o Light & Power Utilities Corp., 1035 Firestone Blvd., Memphis, Tenn.

LIGHT & POWER UTILITIES CORP.

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For further information and prices on L & P fluorescent fixtures—standard or "custom-made"—check the following list, and phone or write the L & P representative nearest you:

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Irving Milow
415 Clover St.
Rochester, N. Y.

Irvin Spero
4142 Stillmore Rd.
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Howard E. Johnson
2976 Randy Lane
Dallas, Texas

Arthur H. Swartz
2120 Polk Ave.
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J. F. Hisserich
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Light & Power Utilities Corp.
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Olive Branch, Mississippi

Richard B. Murdoch
7300 Bailor Ave.
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James E. Clary
62 Flicker
Memphis, Tennessee

William B. Murray
531 Western Ave., N. W.
Atlanta 14, Georgia

Separation of labor, material records slows loss rate

Contractors tell how

By L. A. Parks
Owner,
Parks Electric Service
Edna, Texas

◆ AS A SMALL contractor whose volume does not justify employment of a fulltime bookkeeper (our volume was $41,000 last year), we find it especially helpful not only to keep separate cost records of labor and of materials for each job, but to bill them separately.

Further, we enter receipts from a job separately—one record for receipts from labor, another for materials. Thus, in spite of the fact that our bookkeeping system is quite simple and records are condensed to save time, we are able to check on each major source of income at any time,

(Continued on page 144)

L. A. Parks, Edna, Texas, recommends a simple record system which has worked well for him.

Delivery signal system keeps schedules ahead

By John Colquitt
Gaddis-Walker Electric Co.
Oklahoma City, Okla.

◆ A PLAN we have developed for getting tickets to our deliverymen saves us both labor and time.

On a bulletin board at the rear of our office, all delivery tickets are posted as orders come in. One area is marked off for rush orders and another for routine deliveries to be made during the day. To notify deliverymen working in the basement that an order has been posted, a light switch beside the bulletin board turns on a red light in the basement. When the deliveryman takes the ticket from the bulletin board, he turns the light off.

We feel this is a definite improvement over the loudspeaker system we had used. Often the deliverymen were out of reach of the speaker and we in the office had to remember to keep calling back until we reached them. This way, the light stays on, attracting deliverymen when they return to stockroom.

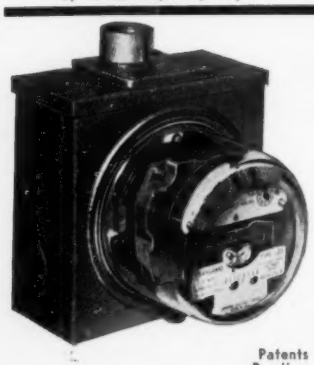
To centralize handling of tickets, a basket is placed under the bulletin board for return tickets.

Gaddis-Walker Electric Company estimator, John Colquitt, presses a switch, sending a red light signal to the stockroom worker below.

A workman in the stockroom looks up as the red light comes on at the edge of the wall clock. He knows an order has just been posted.

Patents Pending

CATALOG WVL-0150A-2"
Size 10½" x 8" x 3⅝"
Up to 150 Amp. Capacity



Patents Pending

CATALOG WV-011-A-1¼"
Size 8" x 8" x 3⅝"
Up to 100 Amp. Capacity

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Designed for the Application

B & C'S ORIGINAL RINGLESS METER SOCKETS

LIGHT DUTY, MEDIUM DUTY, HEAVY DUTY SOCKETS

SINGLEPHASE, POLYPHASE, COMBINATION DEVICES

HORIZONTAL GANG, VERTICAL GANG, SOCKET UNITS

INDOOR AND OUTDOOR TRANSFORMER CABINETS

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UNIQUE TRANSFORMER MOUNTING BRACKETS

OUTDOOR AND INDOOR METERING ENCLOSURES

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METER SOCKET ACCESSORIES, PARTS, SPECIAL DEVICES

B & C's Revolutionary, Unique, Designs Flexible, and Unexcelled in Performance Keeping Pace With the Electrical Industry

Patents Pending

CATALOG WVL-0175A-2"
Size 10½" x 8" x 3⅝"
175 Ampere Capacity
3-Gang Ground
5th and 6th Terminals
Added Line Terminals for
connection to other sockets

Patents Pending

CATALOG WVL-1007-A-2"
Size 10½" x 8" x 3⅝"
7-Terminals — 100 Amp. Capacity

Write for descriptive catalog containing installation data and current price list.

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Design
Installation

Testing
Maintenance

Several voltages can be handled with this mobile substation—see page 76

Cost-reducing ideas for electric distribution—page 66
An effective distribution mapping program—page 70
Ground line treatment of standing poles—page 72
Conventional 22 kv line converted to 66 kv—page 74
Foolproof live line tool hanger—page 78
25 kv feeders favored in Jacksonville—page 81

HOW SOUTHERN STATES' BV-33-F CUTOUT CLEARS RESTRICTED OR HIGH FAULTS WITH EQUAL DEPENDABILITY

The complexities of today's distribution systems present a real challenge to the designers of cutouts. Industry requirements call for interrupting capacities up to three times higher than a few years ago. And yet the cutout must clear restricted faults with equal ease and sureness.

Large bore tubes, vented freely at both ends, will clear extremely high faults easily. Small bore tubes, vented at one end, will clear low faults easily. The big problem is to do both.

The Southern States BV-33-F Heavy Duty Cutout clears the complete range of fault currents with equal dependability—without damage to the cutout.

What About Single-Venting?

In single vented cutouts, the rocket effect of the tube, as gases are ejected, must be considered. Some type of shock absorber to cushion the fuse holder, as it tends to thrust upward, must be provided. But so far no practical recoil mechanism has been devised that can fully absorb the violent recoil action. Thus a substantial amount of shock is transmitted to the mounting, insulator, bracket, and cross arm.

As interrupting capacities on single-vented cutouts are increased, bore diameters become critical. If it is large enough to handle high faults, it may provide only borderline protection on restricted faults. Resorting to some extraneous means, such as special types of fuse links, is a dangerous concession to security—as there is no assurance of proper fusing in the field.

What About Controlled Venting?

Providing a small vent hole in the top hardware to permit a limited amount of gas to escape is not the solution either. This practice was dropped by Southern States long ago, when it was found that the hole became enlarged after each operation, endangering proper clearance of low faults.

Here's the Answer

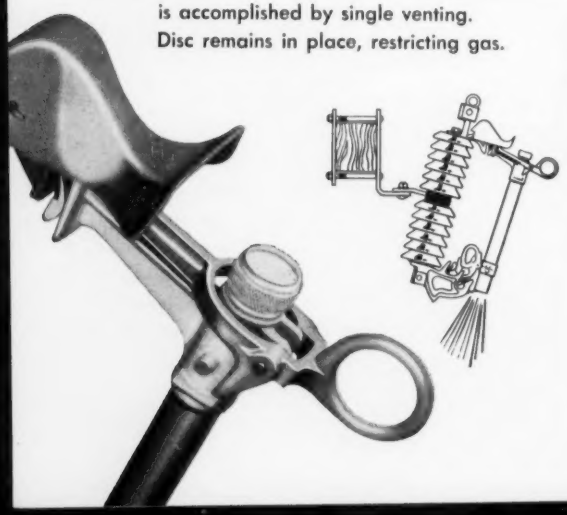
The BV-33-F offers all of the advantages and none of the disadvantages of single-venting or controlled-venting. This is accomplished with an economical expendable cap which confines gases on restricted faults, but allows them to double vent on high faults. Forces inside the tube are equal and opposite. Stress on the mounting is virtually eliminated. The cutout can operate time and time again without loss of efficiency. There is no built-in battering ram—no intricate mechanism, or springs to worry about. And any standard EEI-NEMA fuse link will provide positive operation every time.

Utilities throughout the nation are finding the BV-33-F a practical, workable solution to cutout problems.

Get complete information from your Southern States representative, or write for Bulletin 530C.

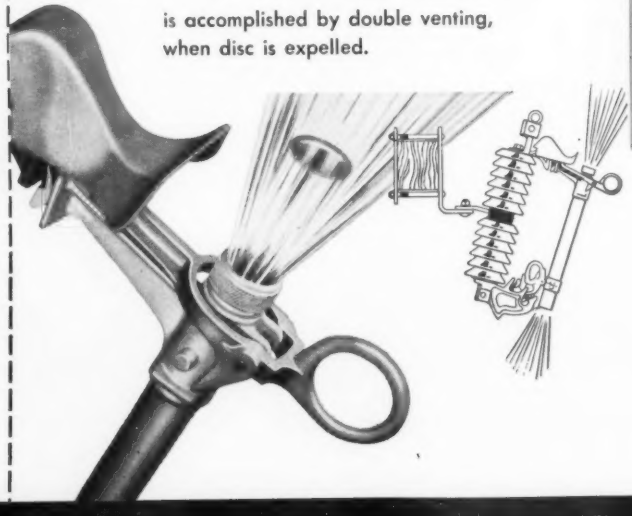
LOW FAULT CLEARANCE

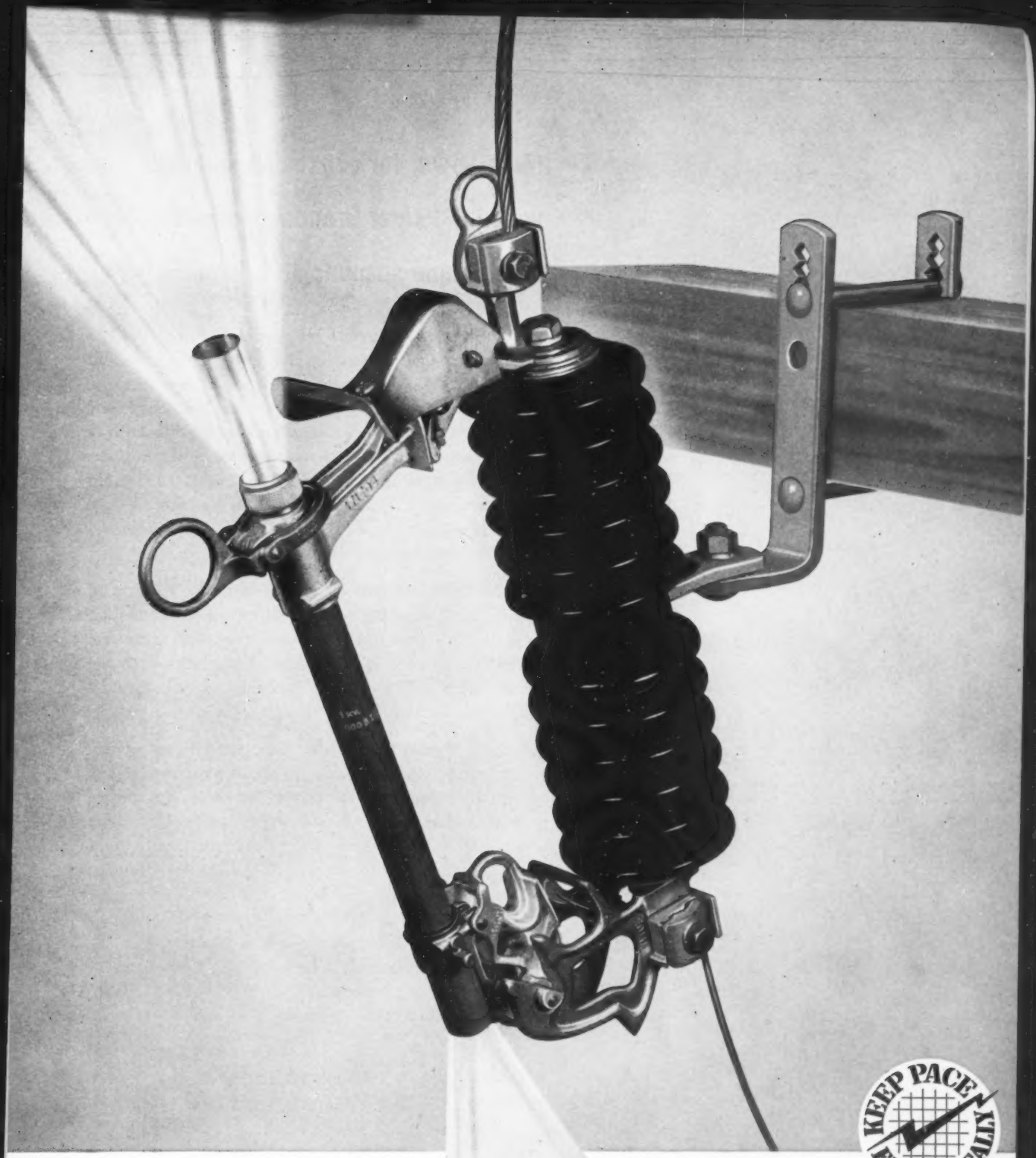
is accomplished by single venting.
Disc remains in place, restricting gas.



HIGH FAULT CLEARANCE

is accomplished by double venting,
when disc is expelled.





KEEP PACE ELECTRICALLY

SOUTHERN STATES EQUIPMENT CORP.

HAMPTON, GEORGIA

IN CANADA Dominion Cutout Co., Ltd., Toronto

More power for expansion supplied with (USS) Tiger Brand Armorlokt Cable over unique suspension bridge

This suspension bridge was built especially to carry high-voltage electrical cables from the power plant to mill at the Ohio Works of United States Steel in Youngstown. The old underground system has become inadequate and to replace it with a new underground system would have been more costly and would have disrupted mill operations.

The largest of the several cables has 500,000 C/M conductors and is 3¾ inches in overall diameter. All are insulated with Amerzone B (Butyl) rubber and protected with interlocked armor.

Armorlokt cable was used for utmost reliability. Failures of power distribution are costly, and represent production losses. This Armorlokt construction offered maximum mechanical protection and electrical reliability with the added "Plus" of complete flexibility of the finished distribution system.

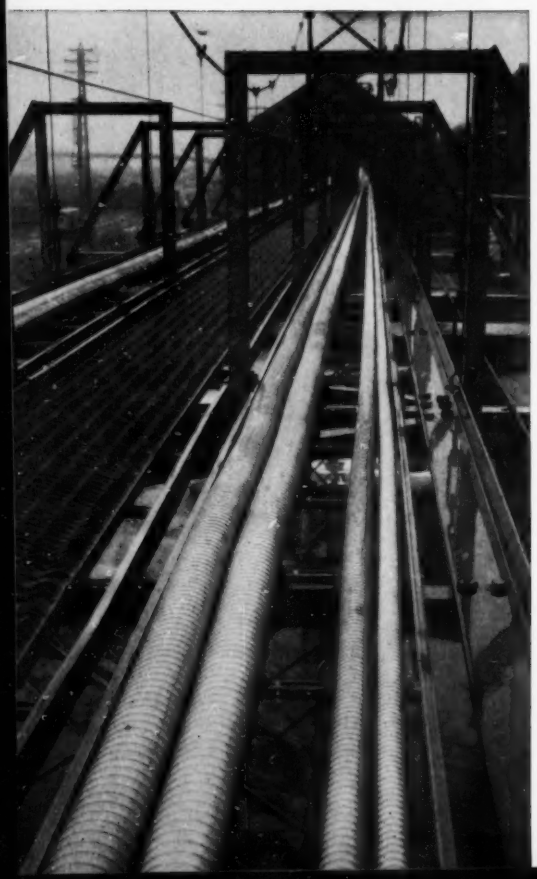
Advantages of open construction. Compared to an underground conduit system, the original cost was considerably less, it provided easy access to the cables for future changes and maintenance and the space on the bridge was large enough to carry double the number of cables for future expansion.

The system was planned by the Electrical Engineering Department of the Ohio Works, United States Steel, of which Mr. M. J. Burger is General Supervisor.

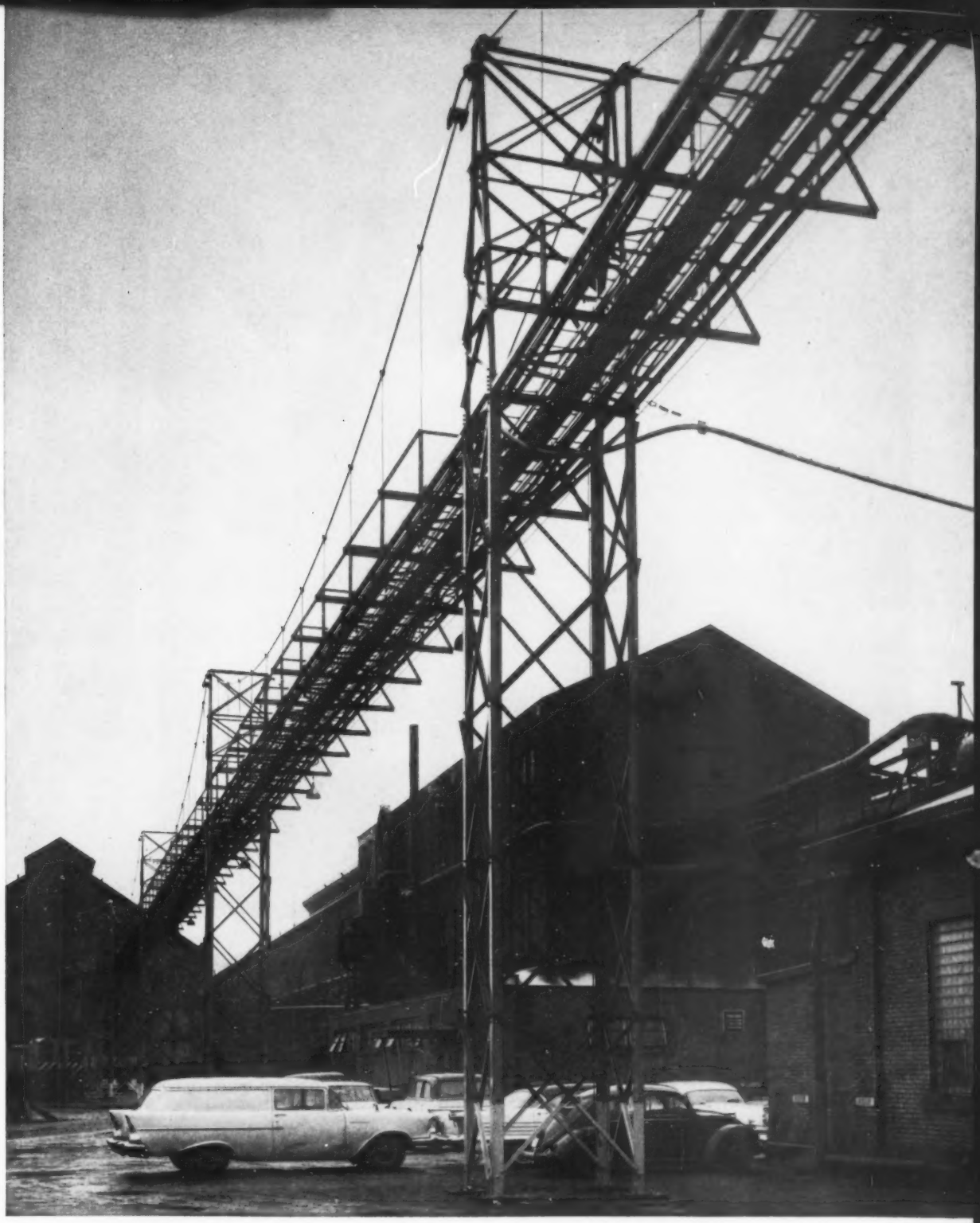
For complete information on USS Tiger Brand Armorlokt Cable, write American Steel & Wire, Dept. 0258, 614 Superior Ave., N.W., Cleveland 13, Ohio.

USS, Tiger Brand, and Armorlokt are registered trademarks

A standard cable for every special job • Asbestos Wire and Cable • Mold-Cured Portable Cord • Shovel & Dredge Cable • Paper & Lead Cable • Varnished Cambric Cable • Interlocked Armored Cable • Special Purpose Wire & Cable • Aerial, Underground and Submarine Cable



Suspension bridge carrying six USS Tiger Brand Armorlokt Cables out in the open for easy access.



USS Tiger Brand Armorlokt Cables offer maximum mechanical protection and electrical reliability. They can be installed in half the time required for other systems, and can be easily pulled around turns.

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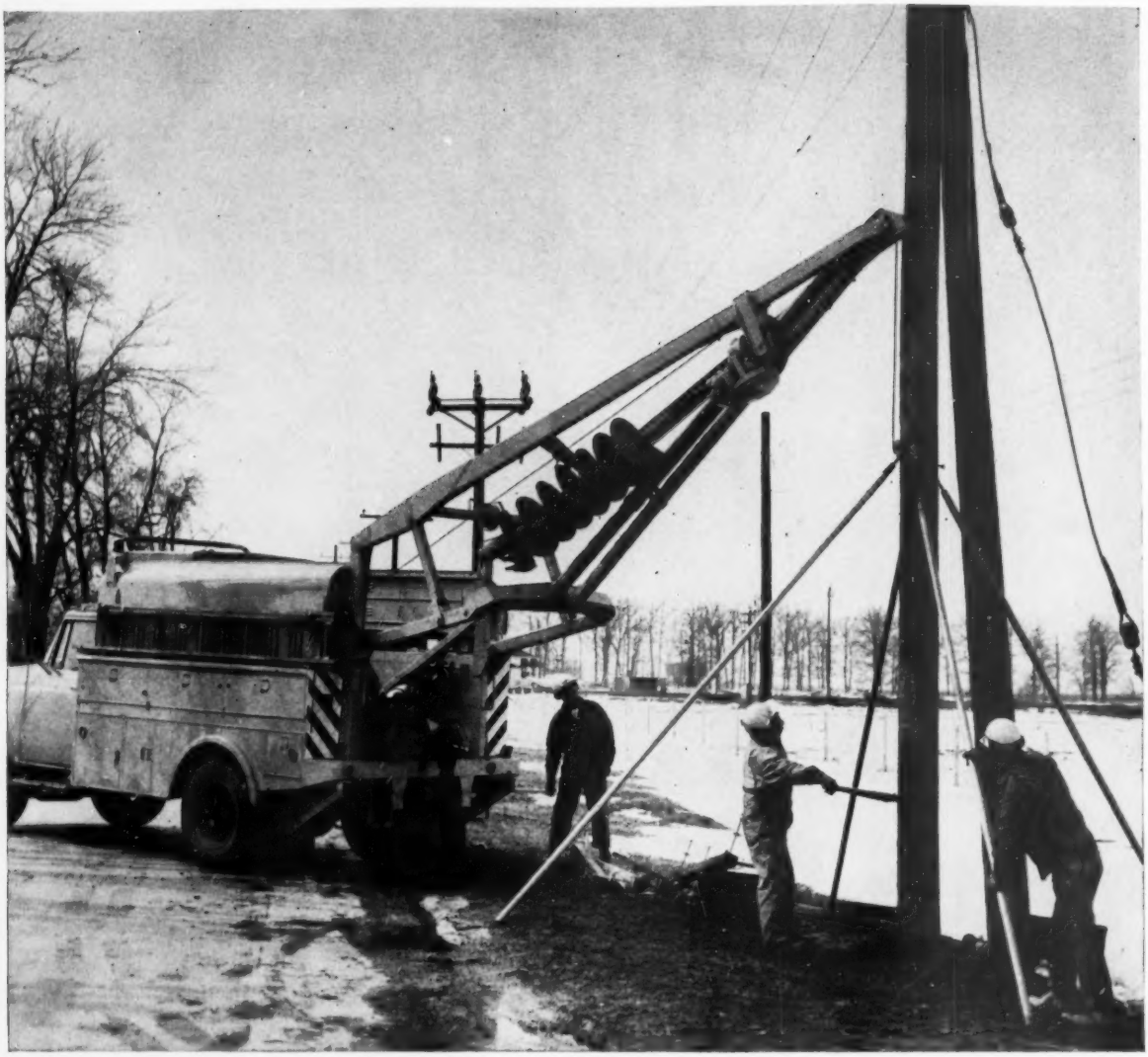

THREE MEN ON A WORKHORSE
save utility $900 in 10 days

Slashing $905.60 from a utility's construction and maintenance cost in a 10-day comparison period is no small accomplishment.

Yet it was easy. Holan's Three-Man Crew Unit went into the field and did the work of five men. Labor costs were drastically reduced—and two men were freed for other work assignments.

The three men used the spacious Holan CM-138 Line Construction Body equipped with a powerful, single-cylinder Model 25-C Derrick and 4401-H Earth Borer.

The five-man crew traveled in a line construction body with crew compartment. A two-legged derrick was used, but all digging was done manually.

The cost comparison was made on such jobs as setting, removing and loading poles, digging anchor holes, pulling butts and installing pole facilities.

Write today for more information on Holan's Three-Man Crew Unit—the body-derrick-digger combination that conserves manpower and saves you money.

Holan Corporation, 4100 W. 150th St., Cleveland 35, Ohio
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HOLAN

RT&E grows to better serve the growing South and Southwest

We're Proud To Be Your Neighbor

with Our New Manufacturing plant—in Arlington, Texas

RT&E Corporation is proud to be the first major distribution transformer manufacturer to locate in the great South and Southwest.

Centered in the heart of this growing area, the Arlington, Texas plant with its latest, up-to-date equipment will provide immediate service and delivery for transformer users in seven states. In addition to manufacturing, Arlington adds another branch warehouse to RT&E's rapidly expanding nation-wide service network.

The new Arlington manufacturing plant, RT&E's third, is part of a carefully planned expansion program to provide the fastest service and delivery of the finest distribution transformers built.

Your RT&E man will be making a neighborly visit to see you soon. And you be sure to visit us when you are in the Dallas-Ft. Worth area — See your distribution transformers actually being built.

RT&E Corporation

WAUKESHA, WISCONSIN
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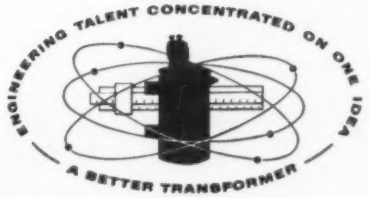

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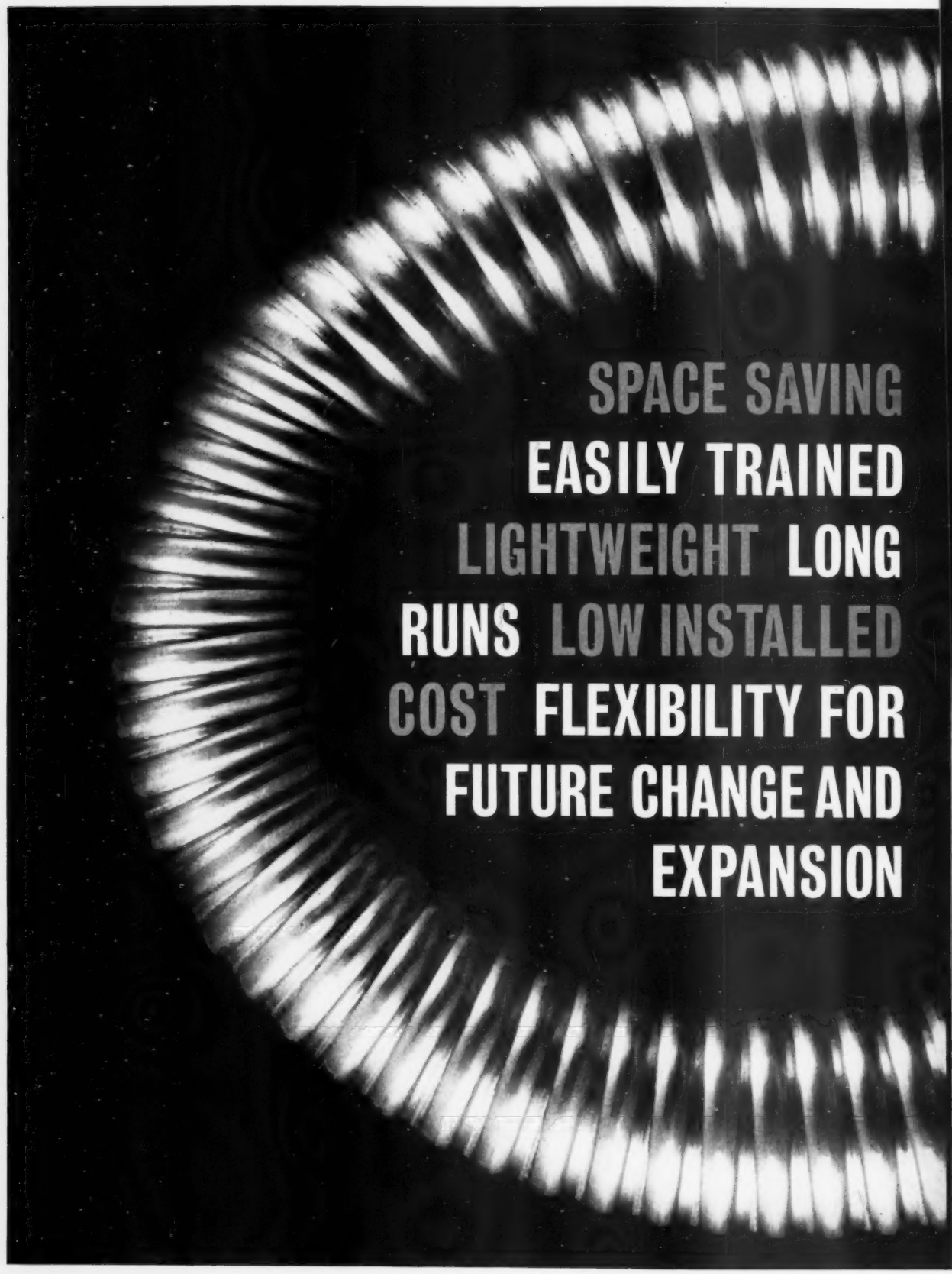
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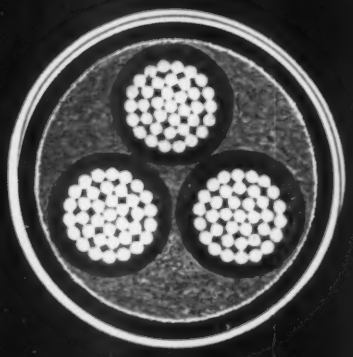

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In the heart of Lake Charles...

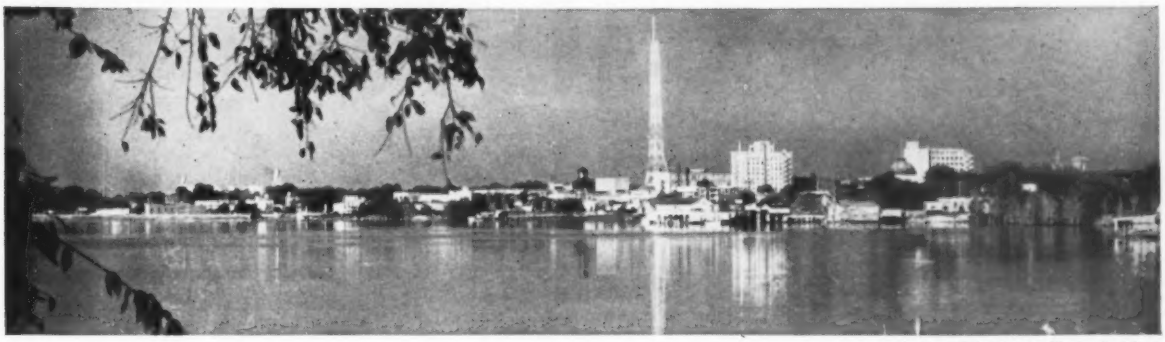

Photo by Rybiski, Lake Charles, Louisiana

Lake Charles, Louisiana ... city on the move. Industrial hub of the Gulf Coast. Major port and center of Louisiana's petroleum industry. Big producer of chemicals. Home of the world's largest rice mill. Good home, too, to 70,000 people.

In Lake Charles, the demand for power grows—steadily, in the long run, but with daily and seasonal demands varying from light to heavy. These fluctuating demands emphasize the importance of automatic voltage regulation to maintain steady voltage under all load conditions. That's why the Gulf States Utilities Company has recently installed a 7500 Kva Wagner Load Tap Changing Power Transformer in the downtown commercial area.

This compact unit utilizes a new design in the load tap changing mechanism, which has been greatly simplified to provide quiet operation and long operating life with extremely little maintenance.

Constant research and development have kept Wagner up front in transformer design for more than 65 years ... made Wagner a leader in power planning. So, remember this:

Wagner makes a complete line of transformers for industrial and power company needs: If your power needs present a critical (or even a potential) problem, call your nearby Wagner Sales Engineer. He'll help you plan your power program ... suggest Wagner power and unit substation transformers that will meet your needs for years to come. There are Wagner branches in 32 principal cities.

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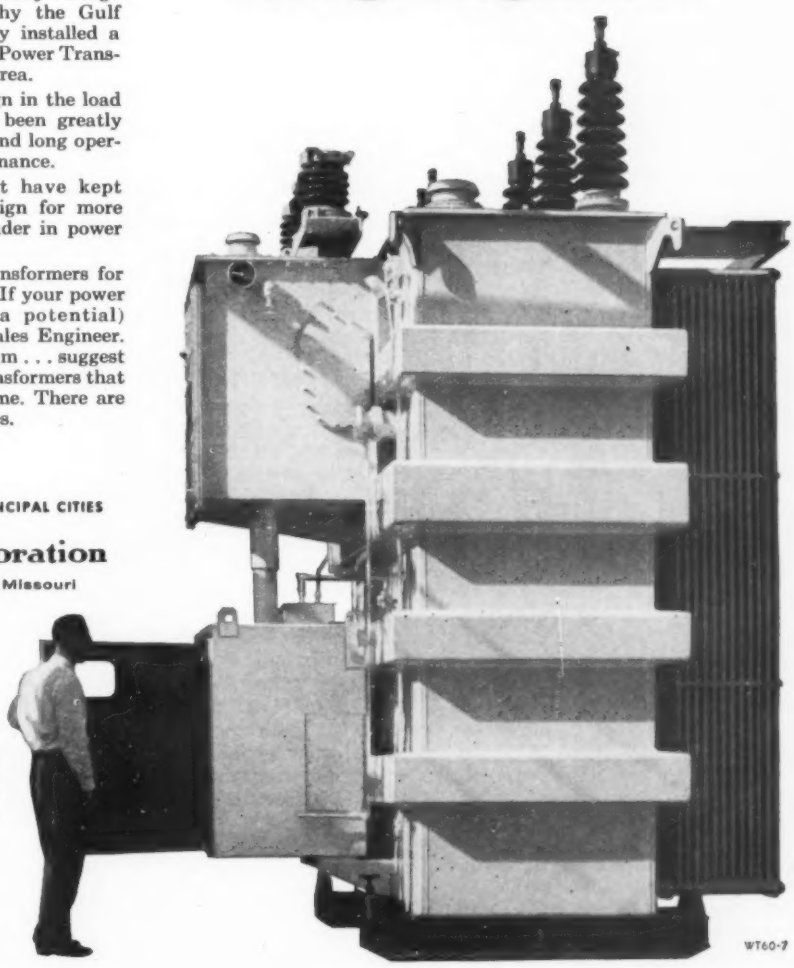
Wagner Electric Corporation

6440 Plymouth Ave., St. Louis 33, Missouri

This Wagner LTC TRANSFORMER Assures Automatic Voltage Regulation



Wagner magnetic amplifier control equipment senses any voltage fluctuation in the line and automatically regulates the voltage to meet the demand.

LIVE BETTER ELECTRICALLY

WT60-7

New cost-reducing ideas for

By J. E. Ames, III
Staff Engineer
Virginia Electric and Power Co.
Richmond, Va.

Joint-use poles

◆ A LARGE PART of our new construction is in residential subdivisions where the distribution is on joint-use poles with the local telephone company. The allocation of space on these poles was negotiated and is specified in a joint-use contract. The 35 foot, class 5 pole was accepted as the basic joint-use pole and the uppermost 4 feet, 8 inches was reserved for use by our company.

This 56 inches is not enough space in which to install a primary circuit, a secondary circuit and a transformer; therefore, the normal practice is to provide 40 foot poles for transformer installations and at anticipated transformer locations. At the time of the original installation we can obtain five feet of additional space by setting the taller pole, or if the pole is to be set by the telephone company, by paying them the difference between the installed cost of the basic pole and the proposed five foot taller pole. This presented no problem.

The problem was the installation of intermediate transformers on existing joint-use poles to serve new customers, or to shorten secondary runs where loads had increased. The cost of *replacing* an existing 35 foot pole was the cost that concerned us. This cost was one that had increased in recent years, and there were more of these replacements necessary than ever before. We needed a means of avoiding this cost, and we decided that all of these poles did not need replacing. An extension that would extend 2 feet above the pole would increase the usable space from 56 to 80 inches, which would be sufficient for a transformer installation.

The extension selected consisted of two 3 x 3 x ¼ inch steel angles extending two feet above the pole and joined together at the top. A clip angle on top of the extension provides for mounting either an insulator pin or a crossarm. The complete extension is mounted on the pole with two ¾-inch bolts, and is strong enough to support blocks for hoisting a 37½ kva transformer. This extension without modification worked very well for the installation of self protected transformers.

We wanted an extension that could be used with conventional transformers, and this was accomplished very easily by having the manufacturer drill the two vertical members of the extension. Now the fuse cutout and lightning arrester can be mounted directly on the extension, and the transformer can still be raised to the top of the pole. In most cases the secondary circuit must be extended out from the pole and raised above the bottom of the transformer tank if the installation is to occupy no more than 56 inches of the pole.

On three-phase lines the extension is used with a crossarm, and the transformer protective equipment is usually mounted on the crossarm. The extension is carried in our storerooms under two stock numbers: one for the extension, and one for the extension packaged with crossarm braces.

Pole-top pin utilized

Recently we have added to our use another extension to avoid replacing 35 foot joint-use poles for transformer installations. The 36 inch pole top pin has been drilled to accommodate mounting of the fuse cutout and arrester, and this will also allow the transformer to be raised high enough to make the installation. This pole top pin costs much less than the heavy pole top extension, but it does not have the strength necessary for use in hoisting the transformer and a gin pole must be used. This pin, of course, will not accommodate the crossarm, and must be replaced if a second phase conductor is added.

These methods of obtaining additional height on 35 foot poles are used only to avoid replacement, and not for new construction. Replacement cost of poles in good condition for additional height only is one that we must avoid if possible.

Double deadends

Our standard construction for the installation of pole top air-break switches used the conventional method of deadending conductors on both sides and usually directly on the switch frame. There were occasional failures of switches, and some switch poles needed replacement because of damage or decay. With the conductors fixed to the switch in this manner, adjustment or maintenance of the switch was a lengthy and costly job, as was the transfer of conductor deadends to a new switch.

We decided to remove the deadends from the switch frame and lower them to an arm below the switch, but then it became obvious that all we needed was a break in the circuit, and not necessarily a conventional double deadend. A single set of suspension insulators was installed directly in the conductors, 12 inches from the pole. The line conductors were then tied directly to pin insulators on the arm below the switch, and jumpers extended up to the switch. Now if a switch needs any major maintenance, a jumper can be added to by-pass the break, the switch leads removed, and the line conductors pulled clear. With the conductors out to the side, and disconnected from the switch, a man can safely rebuild the switch.

This construction can be used with angle pins, or on tangent poles without uneven strains on the switch frame causing special adjustments. More pole height is needed for this installation but this is almost offset by the elimination of insulators, and more than justified by the savings in future work.

The new "floating deadend" proved to be such a success that we immediately extended its use to reclosers, disconnect switches, line fuses, regulators and any other locations where we wanted a break in a circuit. On these installations, no additional pole height is needed, and the elimi-

nation of one-half of the usual suspension insulators is a direct saving.

Pole stubbing

In 1957 we started a program of inspection and treatment of standing poles. This work was contracted, and although we cannot yet determine the full value of the treatment, we have had a very thorough inspection of our wood poles. The contractor has inspected 76,000 poles set prior to 1944, of which 65,000 he treated.

Some poles were found in dangerous condition and presented a hazard to life or property. These poles were reported daily by the contractor, and were replaced immediately. The remaining poles were either good or were rejected for treatment for various reasons, and reported by the contractor with a special note if the pole was not in suitable condition to be stubbed. Our engineering employees then determined which rejected poles were suitable for stubbing, and which were to be replaced.

There are many locations where stubs cannot be used, but in rural lines and other lines not on streets, there is a definite place for pole stubs. We have used many stubs to provide strength for poles with ground line decay, but otherwise sound, and we have used some to provide additional pole height.

You are all familiar with the old standard stubbing method with bolts and stubbing bands. Until recently, we stocked four different sizes of these bands, and always heard complaints that the stub wasn't the same size as the pole, and the bands didn't fit properly. Many poles were stubbed by wrapping with guy wire.

We purchased a new grid gain, and are now using it for stubbing poles. There are two gains that we use: one 4 x 5 inches for 8 to 16 inch diameter poles, and one 8 x 8 inches for 14 to 20 inch diameter poles. These gains have double concave faces with spikes protruding from both faces. Either two or four of these gains are used, depending on the height and size of the pole (on 45 foot, Class 1 and all taller poles we use four gains). The pole is fastened to the stub by using ¾ inch bolts through the stub, the gain, and the pole. Two other bolts are installed to prevent splitting: one through the top of the stub, and the other through the bottom of the pole at right angles to the supporting bolts. When a pole is stubbed because of insufficient ground line strength, the old pole is cut off about 6 inches above the ground and the old stump is removed.

We stock four different size stubs, all 13 feet long, but with varying minimum diameters. These stubs are purchased or salvaged from broken poles and retreated. We believe that pole stubbing can extend the life of poles for many years, and is completely justified in those places where it can be used.

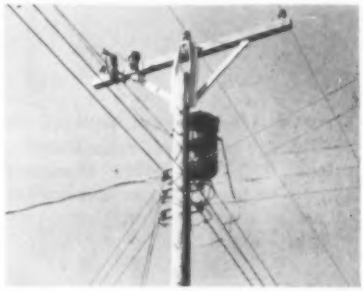
This new method of stubbing reduces cost, (a gain costs about one-fourth of the pole band price), provides a much neater installation and is easier to install. We are making extensive use of this method.

Secondary spacers

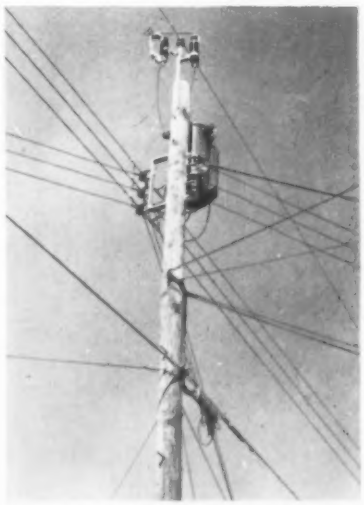
We have adopted triplex cable in sizes of 3 - #2 aluminum and 2 - #1/0 aluminum with a #1/0 ACSR neutral as our standard service drop to residential customers. Our normal procedure was to attach the services to the pole with a wedge clamp and bail in an eye bolt or a spool insulator. When work is required on poles with four services, climbing through these services is difficult, and if the pole is to be replaced, each service drop must be disconnected and the customer's service interrupted while the secondaries and services are transferred.

There is a secondary spreader on the market that we were using in limited locations for mid-span service pull offs. This spreader is made of two pieces of polyester glass mat bolted together with two bolts, and can be installed by removing one bolt and opening the spreader scissor like. This spreader is available with different spacing between conductors, and we purchase one that can be used on our

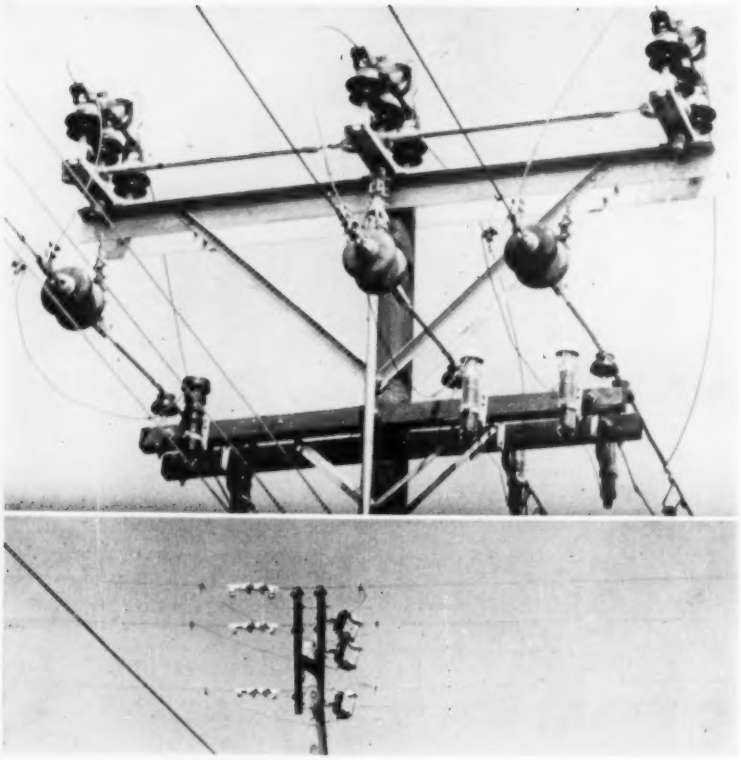
To avoid changing out 35 foot joint use poles when transformers have to be added, Vepco uses this pole-top extension.



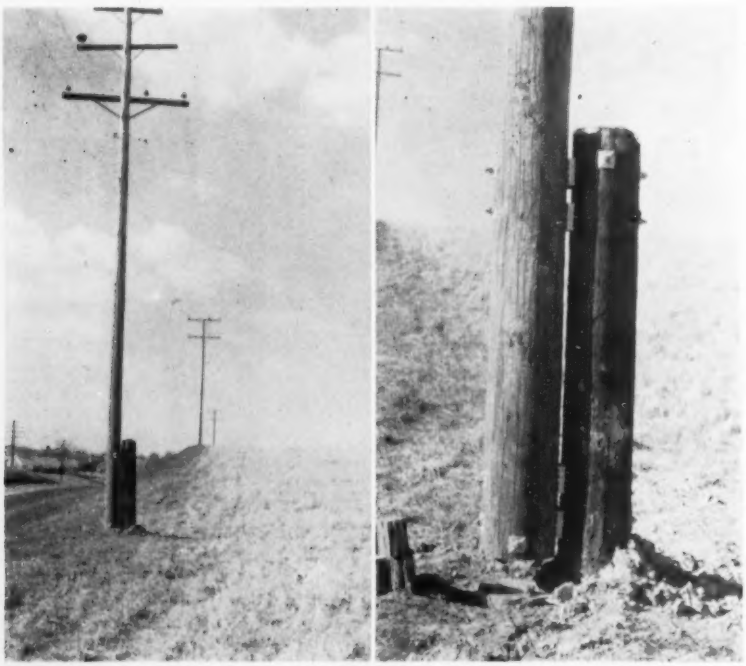
If three-phase primary is involved, a cross arm is used as shown here.



This method has also been found practical, using a 36-inch pole-top pin which has been drilled to accommodate cutout and arrester.



Double deadends to provide for installation of pole top airbreak switches and other such items of equipment such as reclosers, regulators, etc., are being eliminated and "floating deadends" such as shown in these two examples are being used with considerable saving.



Pole stubbing has been used advantageously, especially in the case of rural lines such as the one shown here. The close up at the right shows how grid gains are being used in place of bands.

standard 10 inch secondary spacing. Two bridles allow the attachment of a triplex service on either or both sides of the spreader. In mid-span, the use of this spreader can eliminate the intermediate pole, and we have found some use for it where the service pull off can be reached by a ladder truck. Our safety rules do not allow a lineman to climb a ladder supported by secondary conductors.

A few of these spreaders were used at the pole to move the service out about two feet to increase the climbing space in the secondary area. When the advantages of this installation were realized, the idea was adopted as standard. On poles with open wire secondary and triplex service drops, two spreaders are installed 20 inches from the pole on the secondary, leaving 40 inches of unrestricted space at the pole for climbing space. All future work on this pole can now be done with less time than before. If the pole needs replacing for any reason, the secondary can be transferred to the new pole without interrupting service to the customers.

The pole replacement problem returns at those locations where secondary double deadends are needed. As an experiment we are using our old friend, the floating deadend with strain insulators, to provide an answer to this problem, but this construction has not yet been adopted as standard.

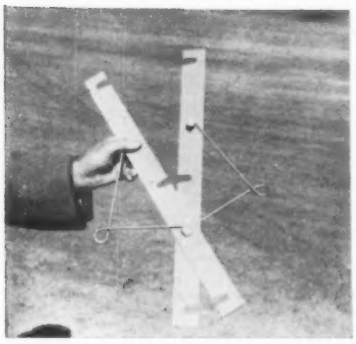
I have dwelt on ideas that either help prevent pole replacement or simplify the work when it is necessary. We feel that pole replacement must be avoided if at all possible, and when absolutely necessary, the associated cost of transferring plant must be kept to a minimum.

Service drops

Customer loads are increasing, and we encounter a few services every month that are to be served overhead with loads between 300 and 750 kva. The connection of these services presents the problem of making the job acceptable from the standpoint of both appearance and cost.

We do not stock covered conductor larger than 500 MCM copper because of the small turnover in the connectors and other fittings.

When currents exceed the capacity of 500 MCM, we use parallel conductors for the service drop, and in many cases, this type of service can be unsightly and costly. Sometime ago we decided to bun-



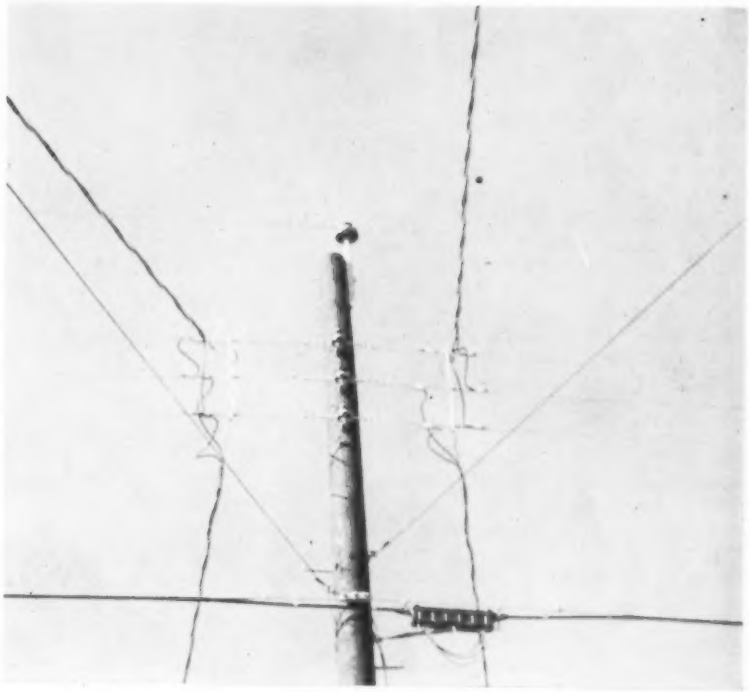
dle the conductors and use one of the conductors as a messenger, or to install a separate messenger. This eliminated extra supports and clamps at the pole and on the building, and in effect made the service appear to be a normal four wire service. The conductors were bundled with soft drawn wire, aluminum tape, friction tape, twine, or mechanical connectors, all of which had disadvantages. With the conducting ties, we had a transformer in the service, and with the non-metallic ones there is the question of its usable life.

Recently we have purchased a spiral polyethylene tape made specifically for bundling conductors, and we purchase it in lengths of 50 feet. This tape can be installed without too much expense, and with it we can bundle any combination of conductors up to 4 inches in diameter. Several of our districts are trying this plastic and have even made up all phase conductors into a single bundle to improve the appearance. The tape has sufficient strength to hold the conductors together on the messenger, and we believe that it will not weaken with age.

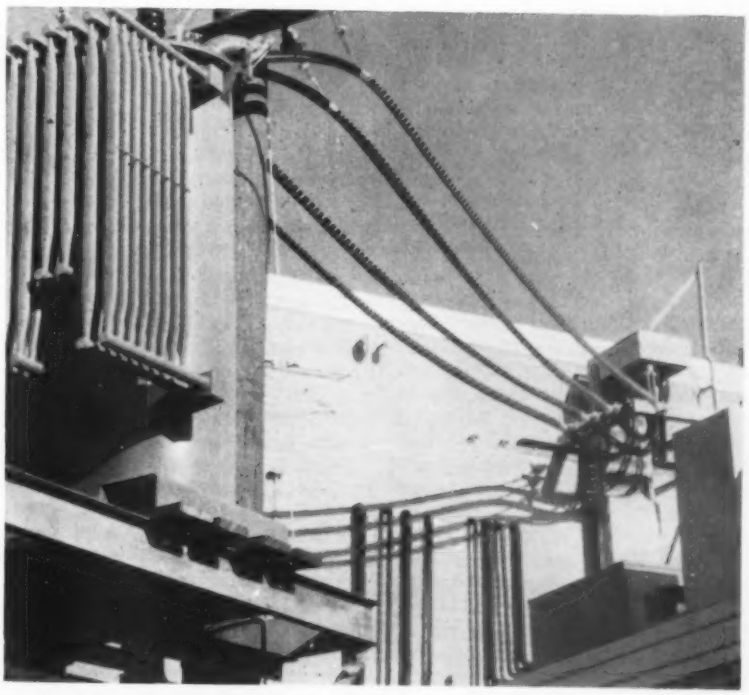
On transformer banks requiring parallel conductors, this bundling of secondaries can save many clamps and connectors by running continuous parallel leads on messengers from the transformer terminals to the customer's service.

This practice is beginning to be used more extensively on our system to provide a neater and less costly installation of overhead services.

The five main ideas I have described here have all been adopted by our company as standard construction methods. The materials used are standard items, which can be purchased from the manufacturer. We believe they are helping us reduce costs and improve service to our customers.

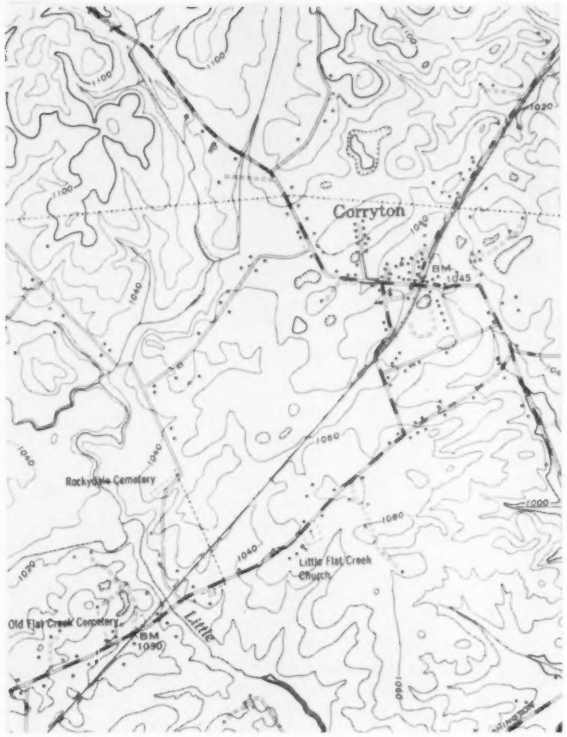


In the past secondary spreaders or spacers have been used occasionally for mid-span service connections, but these spacers are now used as standard construction at poles in order to move service out about two feet and thus increase climbing space. This photo shows a typical installation with four services from tangent pole.



On large service drops requiring parallel conductors, a neater and less costly installation is being made by bundling the conductors. Using one conductor as a messenger saves clamps and connectors.

This is a typical section of completed 13 kv distribution map. The scale is one inch equals 1200 feet.



This is corresponding section of TVA-U.S. Geological Survey map used as a basis for the new map system.

An effective distribution

By F. E. Seaton, Jr.
Distribution Engineer
Knoxville Utilities Board
Knoxville, Tenn.

◆ ADEQUATE MAPS are an essential tool of the utility engineer and are widely used in every phase of utility operation. For this reason, and because of the rapid expansion of the system, the Knoxville Utilities Board initiated a mapping program which is now proving to be a valuable aid in many respects.

Since the end of World War II in 1945, the peak load on the Knoxville electric system has increased from 71,000 kw to 391,000 kw. This growth of approximately 13% per year may be attributed to several factors. There was a general increase in population in the service area; lines were extended into rural areas not previously served; and the average annual power consumption by residential customers increased from 2,400 to 11,000 kwh.

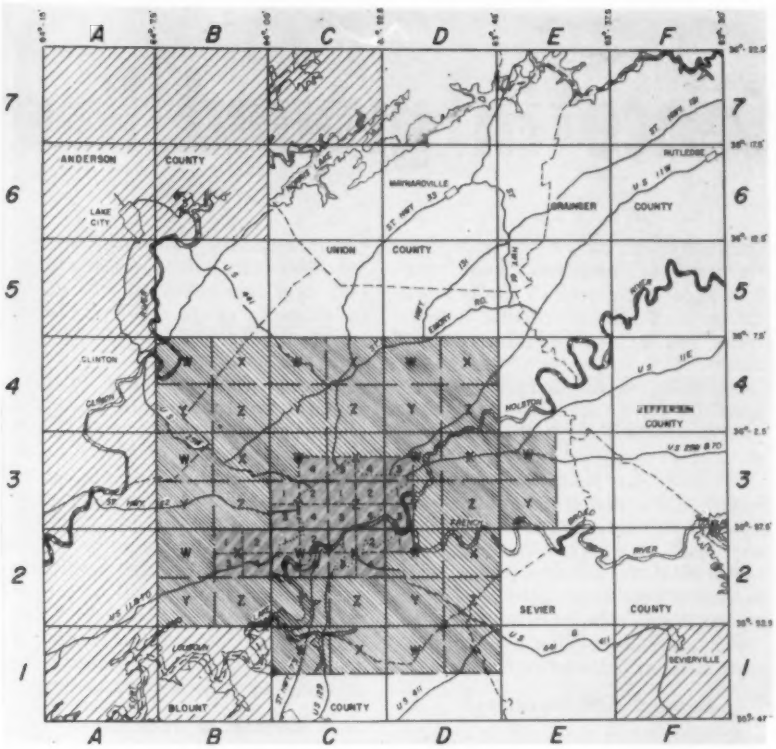
The system maps in 1945 consisted of distribution circuit maps of the entire 2.4/4 kv system and large portions of the urban and suburban 7.9/13.8 kv system. However, keeping pace with the rapid growth of the system required the concerted effort of the entire engineering force, and no appreciable work was done on the maps for a period of several years. By 1956 it became apparent that the existing maps were grossly inadequate and that immediate steps must be taken to initiate a mapping program.

Early in 1957 space was provided and personnel assigned to initiate the program. While a relatively small part of the enlarged service area was covered by the existing maps, the first step taken was to correct these maps to date to serve during the interim period required for preparation of new maps.

Grid system favored

While the correction work was in progress, all available literature on utility maps was studied, and visits were made to neighboring utilities of comparable size to examine their system maps. It was found that the information shown on the maps of these utilities varied widely as did the methods of showing it. However, one thing common to all was the use of a grid system, which fact confirmed a conclusion already reached concerning our maps.

Conferences were then scheduled with personnel of our operating, construction, and engineering departments, and it was decided that our maps would be based on a grid system, would show primary distribution lines, transformers, and sectionalizing, and would be in the form of three-line diagrams



This drawing shows the over-all grid system used by Knoxville Utilities Board in its system mapping program. Three different scales are used.

mapping program

as were the existing maps.

We felt that we were now ready to implement the program, and work was started to determine the scales, physical size of the maps, materials to be used, etc. Since the TVA - U.S. Geological Survey maps were available for our entire service area, it was decided to use these as the basic background data and control medium. These maps cover 7½ minutes of latitude and longitude at a scale of 1″ = 2000′, and most had been revised to 1953.

After experimenting with several scales and sheet sizes, a scale of 1″ = 1200′ was selected for the basic grid which would cover 7½ minutes of longitude and 5 minutes of latitude, or 40 square miles. This produced a map with an active area of 25¼ inches by 30¾ inches, and a sheet size of 28¼ by 34 inches was chosen. One problem encountered at this point was the fact that 7½ minutes of longitude represented approximately 300 feet more land distance at the southern extremity of the system than at the northern extremity. This meant an actual difference of ¼ inch in the length of the maps at the extremes of the system. For sake of convenience it was decided to make all maps the same size with the length determined along the median line of the system area. This resulted in a loss of scale accuracy of less that 0.4%.

The 1″=1200′ scale was suitable for mapping the distribution in the rural areas, but larger scales were required for the suburban and urban areas. Scales of 1″ = 600′ and 1″ = 300′ were chosen for these areas and were obtained by dividing the basic grid into quadrants for the 1″ = 600′ maps and further dividing these maps into quadrants for the 1″ = 300′ maps. These scale enlargements produced maps of the same size as the basic grid but covered only 10 square miles and 2.5 square miles respectively.

1200 square miles mapped

To cover the 800 square miles of service area and allow room for possible expansion, the grid system was designed to consist of 30 basic grids covering approximately 1,200 square miles. Together with the scale enlargements required, a total of 99 background maps were necessary to cover the area. Since we had neither the personnel nor the equipment to make the scale enlargements of the 1″ = 1200′ maps, this work was contracted.

The contracting firm first provided us with a preliminary print of each map at the desired scale showing only roads, streams, railroads, etc. These prints were checked in the field by our field engineers, and road names and other additions and corrections were noted on the print. These prints were returned to the contractor who prepared the finished tracing in India ink on cloth. By contracting this phase of the work, we were able to gain several months toward completion of the maps.

It might be well to mention here that serious consideration was given to the newer plastic drawing materials for these maps, but though their dimensional stability was excellent, it was found that they were considerably more expensive and that most drawing inks would not adhere to the surface. For these reasons they were not used.

Also to be mentioned is the very successful use of odometers purchased for our field cars. These instruments, calibrated in feet and mounted on the dashboard of the car, are driven by means of a flexible cable and a dual head arrangement at the speedometer attachment on the transmission. They operate at regular highway speeds with less than 1% error and have been invaluable in all phases of the mapping field work.

As soon as the first group of background maps was received from the contracting firm, the field engineers began the tremendous job of plotting the distribution lines and equipment on the prints. In order to keep the background maps in original form, reproduced tracings were made on sensitized tracing cloth, and

(Continued on page 144)

Experience in ground line

By J. M. Mabe

Superintendent of Transmission
Central Power and Light Co.
Corpus Christi, Texas

◆ HISTORICALLY the growth of electric utilities was characterized by the use of large numbers of wood poles for transmission and distribution lines. In the South and Southwest, electric utility poles were normally pine with some type of preservative, usually creosote. Initially there was little, if any, standard procedure for the inspection of these lines to determine whether or not poles were sound.

As pole life approached 30 years an increase in the number of defective poles, usually rotten at the ground line, found by accident or by casual inspection, brought to the utility engineer's attention the need for an adequate program to maintain transmission lines and to extend the normal life of creosoted pine poles.

Usually maintenance crews made periodic inspection of standing poles in order to determine the need of replacing older poles. This inspection consisted of sounding the pole to determine heart rot and excavating around the pole at the ground line in order to determine the extent of ground line decay. The excavation was then back-filled with dirt from the area.

This practice resulted in accelerating the decay of a pole which, if it had not been dug around, might have lasted a number of years. Consequently, some utility engineers began investigating methods of sterilizing soil returned around a pole and methods of applying some type of treatment to the ground line region of standing transmission poles to retard decay.

A study of decay patterns for various types of soil and annual rainfall, as shown in the accompanying charts, shows that no regular pattern exists. The high percentage of poles replaced in some sections after approximately 30 years was alarming.

Ground line treatment

Ground line treatment of standing poles was not a new idea. Utility companies, primarily in the East, using cedar poles had been ground line treating for a number of years with success. However, creosoted pine poles with 85 - 95% of sapwood penetrated with an excellent wood preserver seemed to be practically immune to decay from the outside and even the most optimistic doubted the feasibility of attempting to avoid inner decay in Southern pine poles by ground line treatment.

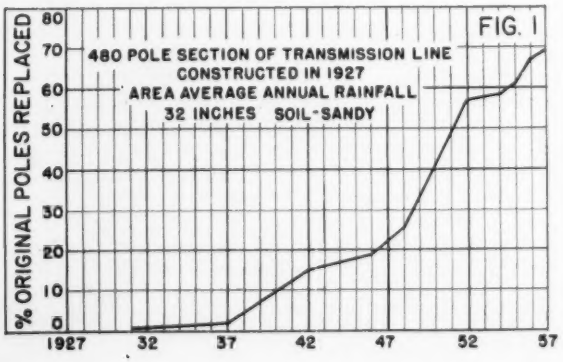
Needless to say as wood poles in the South approached 30 years of age, the number of pole replacements because of decay became apparent. This was of concern to the operating personnel of these companies as the cost of such replacements in transmission lines was becoming increasingly expensive and the expected life of 30 to 40 years could not be realized unless the ground line decay was retarded.

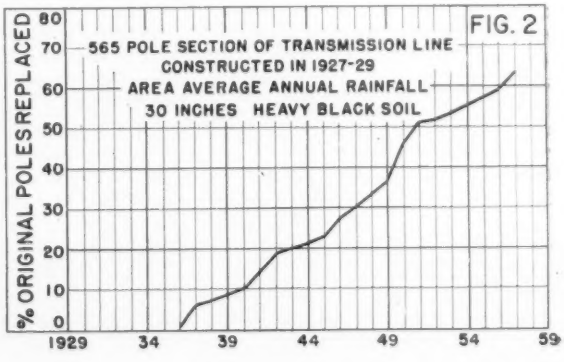
In order to determine the pole replacement on some of the older transmission lines, Central Power and Light Company in 1956 inspected two lines in different areas of the system and found that over 50% of original poles had been replaced in approximately 30 years. This fact, plus consultations with other utilities and some pole suppliers prompted Central Power and Light Company to begin a program of ground line treatment of standing transmission poles.

Method of treatment

Several methods of ground line treatment were considered. The simplest, and one which had been used when resetting sound poles, was to attempt to sterilize the soil removed from around a standing pole by merely pouring creosote, Penta, or other preservative on the backfill. This procedure was considered better than doing nothing; however, some of the materials which could be applied directly to the pole seemed to offer more promise.

The method selected for the initial ground line treatment was that offered by Osmose Wood Preserving Company. Toxic salts in a coal tar vehicle were to be applied to the ground line area, after removing any decay, with a mop or





treatment of standing poles

brush. A protective bandage was then wrapped around the treated pole before backfilling.

Treating by contractor

Central Power and Light Company decided to contract for the ground line inspection and treatment of approximately 1,200 poles, using the method described above. The contractor was to dig around poles to a depth of 18 inches, take a boring from the ground line area, and after inspection treat or reject the pole.

In order to determine whether a pole with decay should be treated or rejected it was necessary to calculate and establish standards for each line to be inspected. Conductor size, number of conductors, type of construction, i.e single pole, H-frame (with and without X-braces), and expected safety factor were considered. Minimum shell thickness for poles with heart rot was determined as well as pole circumference after removing outside decay. Decayed pockets were to be measured after removing all decay and effective pole circumference reduced by the extent of the decayed pocket.

The contractor was given tables containing this information for each line to be inspected. Decayed poles were then treated or rejected in accordance with these standards. All poles dug around that showed slight or no decay were to be treated prior to backfilling. Poles in the line undergoing inspection set after 1945 were not to be dug around but were to be recorded as a matter of information.

This ground line inspection was contracted in 1957 at the rate of $4.00 for treated poles, $2.75 for rejected poles and $.25 for reported poles (poles not dug around for inspection). Company personnel observed the operation and were satisfied with the methods used by the contractor and reports made by the contractor's foreman were considered adequate.

The results of the first ground line treatment were interesting. A tabulation of these results follows: total poles inspected, 1,037 (100%); poles rejected, 43 (4.2%); poles with decay, treated after removing decay, 251 (24.2%); and poles treated, slight or no decay, 743 (71.6%).

Treatment by company crews

The following year the contractor found it necessary to increase the cost of ground line treatment of cross country transmission poles approximately 25%. This increase in cost, plus the fact that there were some inspections which the contractor could not perform, for example climbing the poles to observe woodpecker damage and the condition of insulators, hardware and crossarms prompted the Central Power and Light Company to begin the ground line treatment of transmission poles with company line crews.

A typical crew for this type of work consisted of a foreman and six men—usually three linemen and three groundmen. Two of the linemen were sent ahead or followed the ground line treating crew and made a climbing inspection of the line. The foreman and the remainder of men inspected and performed the actual ground line treatment.

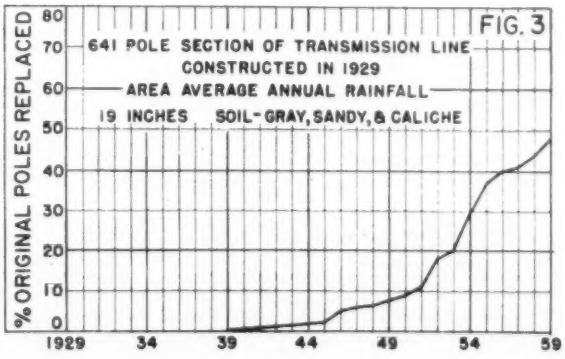
The average cost of poles treated in this manner was $5.85, or $.60 per pole higher than the cost of contracting ground line treatment; however, we feel that the inspection and treatment by company personnel was adequate and could be done at times when work load for company crews was light.

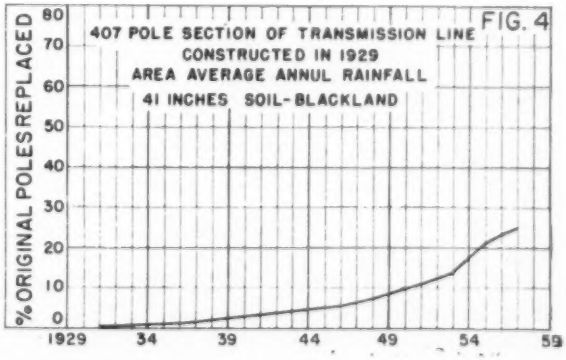
As the work was done by the crews who normally maintain transmission lines, there was no question by the property owner concerning what was "going on" on his land. In cultivated areas, it was convenient to schedule the work at a time when crops had been harvested or before they were planted.

During 1958 and 1959, company crews inspected approximately 8300 poles. Essentially all the line sections covered by this inspection were constructed during 1929-1931. A tabulation of the results follows: total poles inspected, 8,357 (100%); poles rejected, 365 (4.3%); decayed poles, treated after removing decay, 522 (6.2%); and treated poles, slight or no decay, 7,470 (89.5%).

When poles need treatment

There has been considerable discussion among utility engineers





regarding the quality of creosote used during and immediately after World War II. Central Power and Light Company in 1946 built an eighty mile transmission line. Since that time there have been no pole failures because of decay reported; however, the line had not been inspected to determine the extent, if any, of ground line decay. In order to evaluate the treatment of 1946 poles in this line, 720 poles at the southern end of the line were inspected in 1958. Two poles were found unfit for further service because of decayed pockets, four poles were treated after removing outside decay. The remaining poles showed slight or no decay. Present plans are to inspect 450 poles in 1963 and unless serious ground line decay is found, the remaining poles will be inspected in 1968. Poles treated in 1958 are scheduled to be inspected and retreated in 1966.

Today the transmission system contains about 64,000 poles—approximately half have been installed since 1945. In the next four years plans are to inspect the poles in all transmission lines con-

(Continued on page 143)

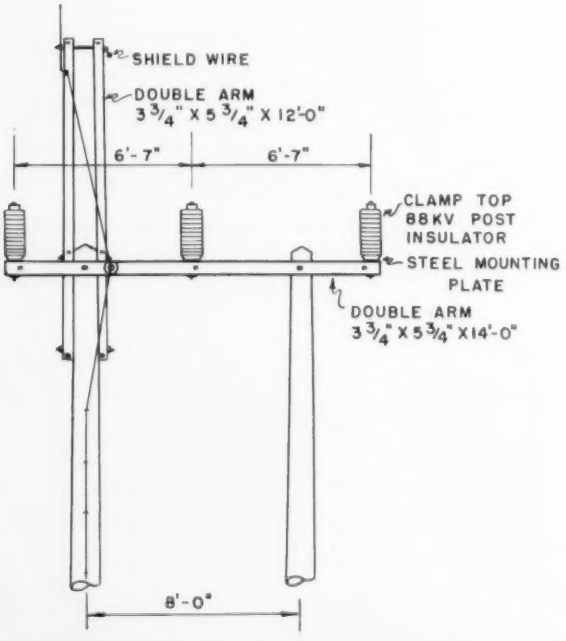
Conventional 22 kv line converted to 66 kv operation

By R. M. Hill
Senior Lines Engineer
Monongahela Power Co.
Fairmont, W. Va.

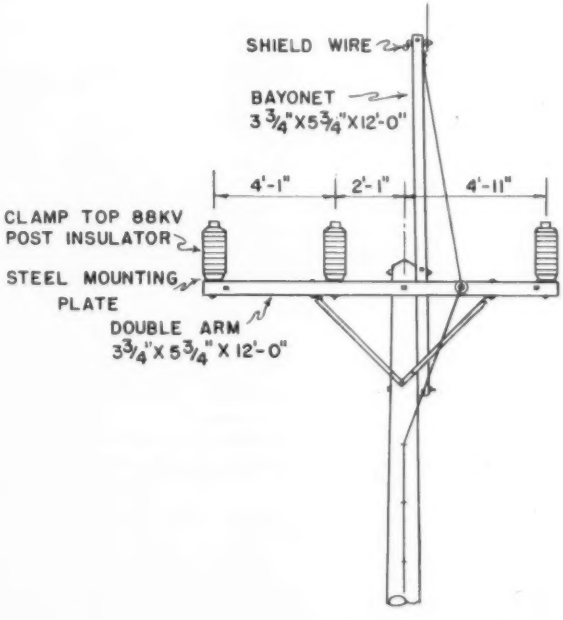
◆ CONVERSION of a 10.75 mile section of 22 kv line to 66 kv operation saved the Monongahela Power Company over 50 per cent of the cost of construction of a new line. Development of a coal field in Gilmer County, West Virginia increased the load beyond the capacity of the 22 kv line to serve the area. A study showed that it would be necessary to extend a 66 kv line into the area. As a part of this extension, the conversion of a part of the 22 kv system to 66 kv operation was determined to be the best solution.

This 22 kv line was originally constructed in 1929 with 1/0 bare stranded copper conductors. Most of the structures were single-pole with ten foot arms, and two-pole with fourteen foot arms. The span lengths vary from 150 to 1,500 feet, the average being 500 feet. All of the poles have been replaced. A study of the lightning damage was made and it was decided to cover 37 per cent with an overhead shield wire.

On the sections not covered with shield wire pole top brackets were installed on the single-pole structures for the center phase, using the ten foot arms. Where shield wire was installed twelve foot arms were used offset as shown to provide clearance to ground down leads. All arms were made double and steel mounting plates installed to support 88 kv post insulators. All of the construction was done with the line energized at 22 kv. The copper conductors were cleaned at all supports and bronze armor rods installed. Clamp top insulators were used to avoid slippage of conductors due to uneven ice loading. This line has been operating at 66 kv for eighteen months without an interruption due to line trouble.



Construction details for conversion of two-pole structure from 22 kv to 66 kv with shield wire.



Construction details for conversion of single-pole structure from 22 kv to 66 kv with shield wire.

New G&W "Off-the-shelf" shipping system

means faster deliveries; reduced installation costs on potheads and oil fuse cutouts!

Orders received in the morning at G&W are often on their way to you the same afternoon. There's no time wasted in getting standard G&W Capnut and Sodertite Potheads and Oil Fuse Cutouts you need to meet most installation requirements.

G&W's new "Off-the-shelf" shipping system is unique and fast. Components of given assemblies are gathered from stock, checked, crated, and sent on their way. When you receive equipment in component form, your installation costs are minimized because you avoid needless disassembly time before the unit is installed.

This new shipping system is typical of improvements being made in G&W services. It is another example of why it pays you to rely on the acceptance, dependability, and quality standards that have made G&W specialists in the electric-power market. There is a pride of craftmanship in every product produced and attention given to detail is unexcelled in the industry. Thorough and precise workmanship means all the difference between years of trouble-free operation and the irritating and costly failures caused by inferior design and poor quality.

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superior quality standards — inspired specialized design

Flexibility features AP&L

By R. W. Toler
and M. W. Rice

Arkansas Power and Light Co.
Pine Bluff, Ark.

◆ ARKANSAS Power & Light Company has recently put into service a 13.2 kv 300 kva mobile substation in the Central Division with headquarters at Pine Bluff, Ark. The unit was assembled at the company's Service Center at Pine Bluff by construction and stores personnel, a journeyman cable splicer, and mechanics and welders from the company garage.

The unit is built on a four wheel wagon with extra tall sheet steel sideboards and end gates and is composed of the following items of equipment:

3—100 kva 7620/13,200Y — 120/240/277/480 volt single-phase transformers.

1—special Bakelite terminal board.

3—15 kv single-pole 200 ampere oil switches.

3—15 kv boric acid power fuses.

1—set of special reel and cable equipment with three 100 foot lengths of 15 kv Number 2 copper, rubber insulated, shielded neoprene jacketed cables with factory installed rubber terminal insulators and lugs.

1—galvanized steel framework for mounting oil switches and fuses.

2—sets of 500 MCM 600 volt rubber insulated neoprene jacketed cables with terminals on both ends mounted on permanently installed reels.

The transformers and terminal board for this mobile substation were built to Arkansas Power & Light specifications by Central Transformer Corp., of Pine Bluff, Arkansas. The special reel and high voltage cable were designed and manufactured for Arkansas Power & Light by the Okonite Company. Space under the galvanized steel structure is provided for storing and transporting the reel and cables, however, this equipment is removable and can be used separately as required. The mobile substation is also designed to operate from overhead open wires. There are rubber bushed access openings directly under the terminal board for the low voltage cables and under the galvanized steel switching structure for the high voltage cables.

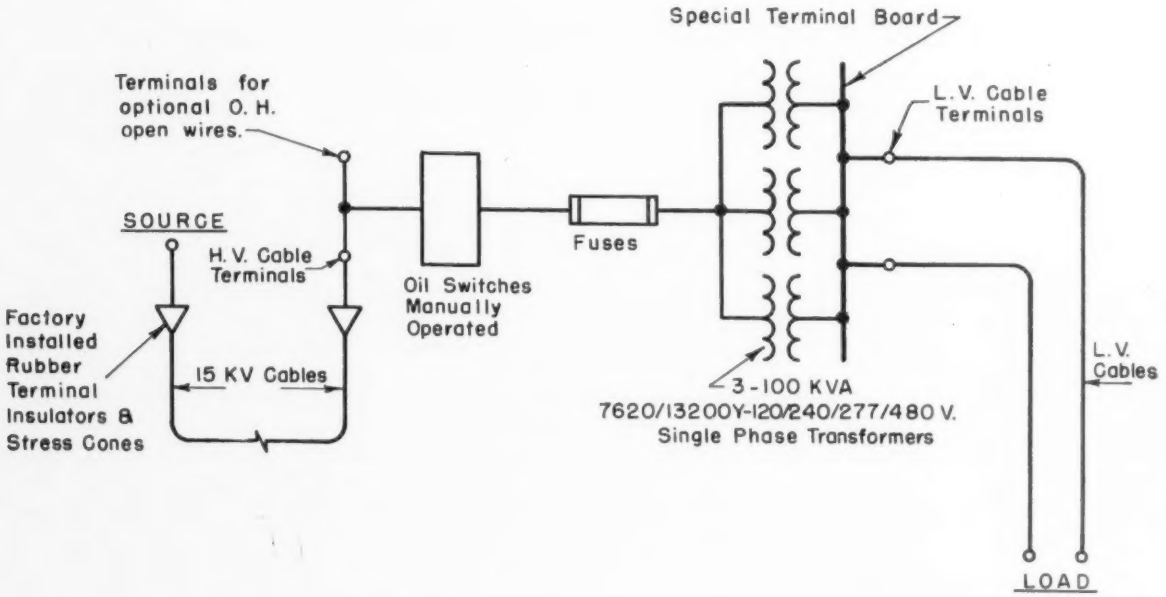
As shown in the illustrations, each transformer has eight low voltage bushings which are permanently connected to corresponding bushings on the Bakelite terminal board.

Four voltages available

An examination of the connection diagram nameplate mounted on the terminal board reveals that the following voltages are available at 300 kva:

(1) 240 volts delta with 120 volt lighting tap.
(2) 208Y/120 volts.
(3) 480 volts delta.
(4) 480Y/277 volts.

In addition, 120/240 volts single phase is available at a capacity of 100 kva. *(Con't on page 142)*

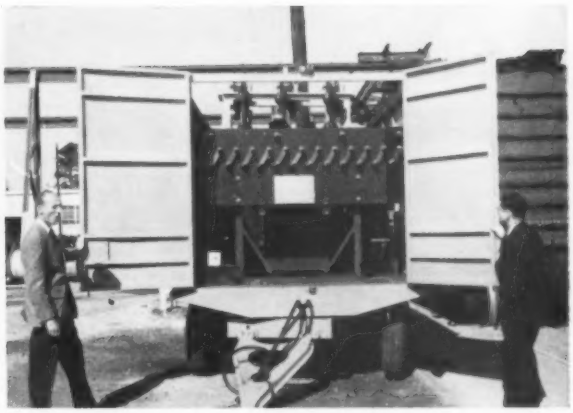


300 KVA MOBILE SUBSTATION

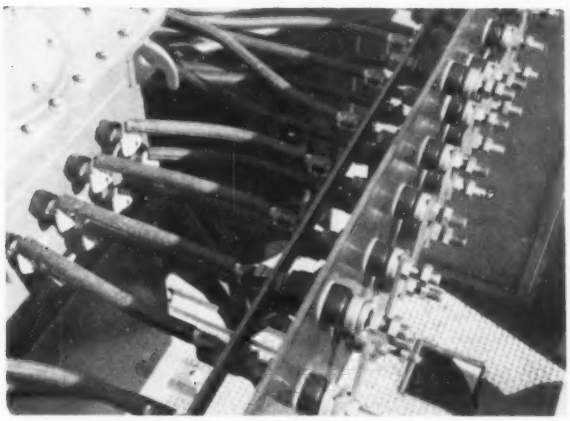
ONE LINE DIAGRAM

13.2 kv mobile substation

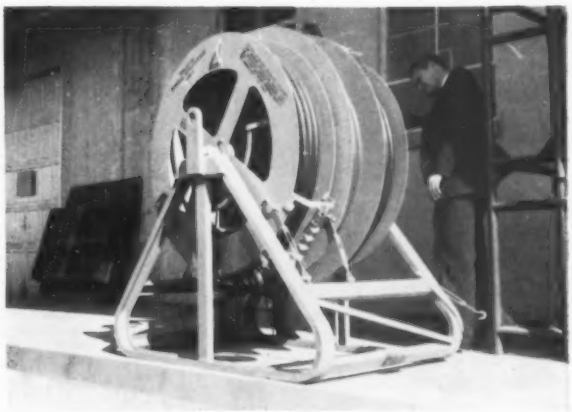
An over-all view of the mobile substation with the forward end doors open showing low voltage taps.



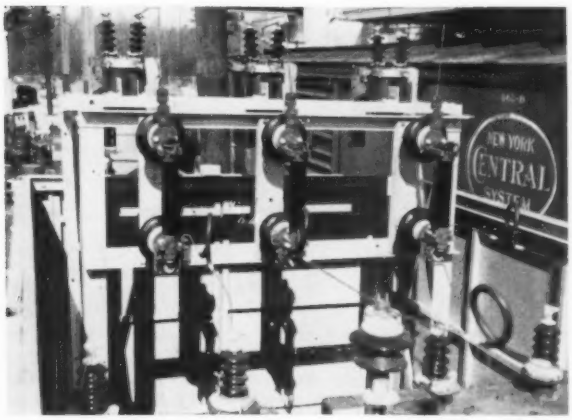
An end view showing the low voltage terminal board which permits a choice of five secondary voltages.



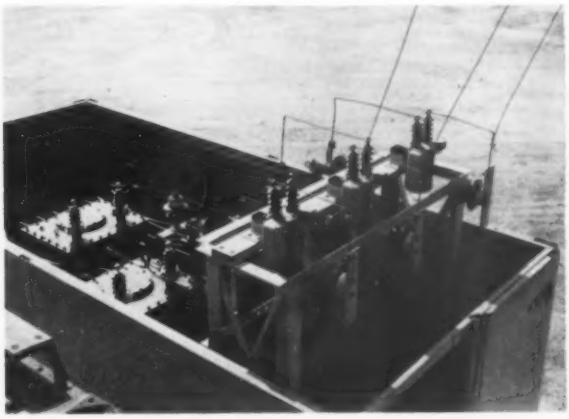
Closeup view from overhead showing permanent connections from transformer to the terminal board.



This three-section high voltage cable reel mounts under the galvanized steel switching structure.



Boric acid filled power fuses are mounted on one side of a steel framework which supports switches.



Mobile unit may be energized from overhead open wires or by means of the cables stored on the reels.

Foolproof live line tool hanger

By Andrew C. Brown
Supervisor Distribution Methods
Virginia Electric and Power Co.
Richmond, Va.

◆ A LARGE PORTION of our company's distribution system has been converted to 12.5 kv and, consequently, we do a lot of live line stick work. During the past three years, we have had several live line sticks fall from conductors on which they were hung while not in use. The causes varied from sudden movements of the conductors to actually jostling the sticks off the line by linemen changing positions on the pole.

The practice of hanging unused live line sticks probably started by hooking the tie wire assistants of tie sticks over conductors. Later, when so many different tie stick blades were developed, the tie wire assistants were only used for stick hanging, and then manufacturers began to put J-hooks on other hot line tools.

Our T. & D. Section inquired of the live line tool manufacturers the possibility of developing a simple foolproof tool hanger which could be easily engaged or disengaged, yet would not accidentally disengage. The manufacturers told us that the problem was local with us and that development would be slow and costly. Then we had another tool fall, which struck an employee on his head and, although he wore a hard hat, he was injured. The hard hat probably saved his life.

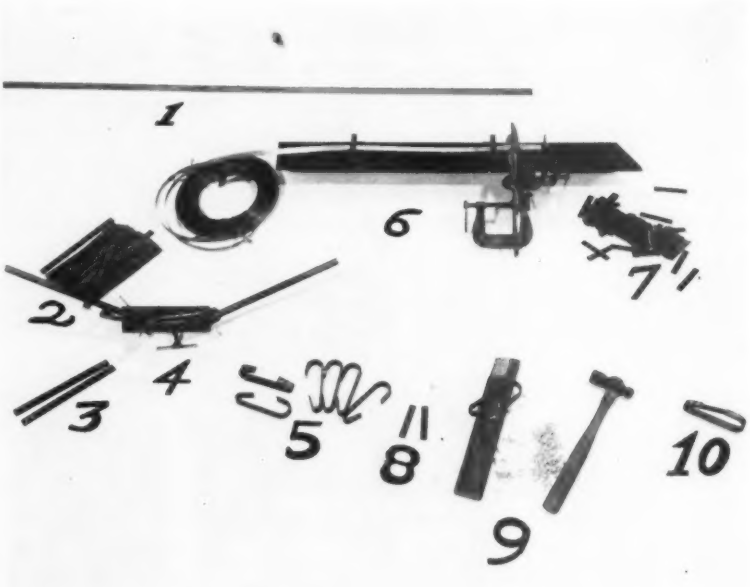
Our Safety Director acted immediately by banning the hanging of tools on conductors by means of J-hooks. This created an awkward operating problem but, since "Necessity is the mother of invention," it was quickly solved.

We asked for suggestions and, from these, we selected one design as simple, easy to construct, and workable. In an accompanying illustration, one of our locally designed tool hangers is shown. Joseph H. Dove, an ingenious machinist at our Alexandria Plant,

(Continued on page 142)

Mr. Brown shows how tool hanger works. A steel spring prevents the tool from accidentally disengaging.

Joseph H. Dove, a Vepco machinist developed a jig on which he turned out 1,500 of the hangers in a week.



These are the tools and parts used to turn out the 1,500 live line tool hangers needed by Vepco's T&D department. (1) Strap iron. (2) Iron cut to length. (3) Lengths drilled. (4) Jig for forming. (5) Formed hangers. (6) Jig for cutting spring steel. (7) Cut springs. (8) Springs drilled. (9) Rivets and tools. (10) Finished product.

Birmingham's 20th Street, looking north, after conversion recently to mercury vapor lamps. Use of existing luminaires and poles lowered the cost of this conversion from $408 per pole down to $141 per pole.

Existing system adapted for mercury vapor

By R. E. Hawthorne
Senior Distribution Engineer
Alabama Power Co.
Birmingham, Ala.

◆ THE STREET LIGHTING system in downtown Birmingham was installed over thirty years ago and consisted of ornamental post top luminaires mounted on steel poles. The system was connected for multiple operation with underground circuits and was controlled by a manually operated pilot wire that is still used for the entire city. The steel poles were installed on 100-foot centers, opposite spaced.

About 15 years ago, the city requested that the lighting be upgraded to keep in step with the changing trends of lighting. The original steel poles were modified and type I V pendent type luminaires were installed on four foot brackets. An extension had to be added to the majority of the poles to provide a 23-foot mounting height. Some of these units had 10,000 lumen lamps and others had 6,000 lumen lamps.

In 1959, the City of Birmingham realized the need for additional lighting on the heavier travelled streets and requested that a mercury vapor system be installed.

This request to change over to a mercury vapor system naturally presented a number of problems. The city did not desire to provide any cash outlay for the installation of a new mercury vapor street lighting system. This left the possibility of making an additional conversion of the old steel poles and pendent type luminaires to install a mercury vapor system.

A trial installation of 20,500-lumen, color-corrected lamps was made to determine if there would be adequate uniformity in the light pattern, to be sure the glare was not objectionable, and to secure the city's approval on the conversion. By using a color corrected lamp in the existing pendent fixture, it was agreed the converted system would be satisfactory.

The average maintained light level was increased approximately 30 per cent in the area where the 10,000 lumen lamps were installed and approximately 128 per cent where 6,000 lumens were used.

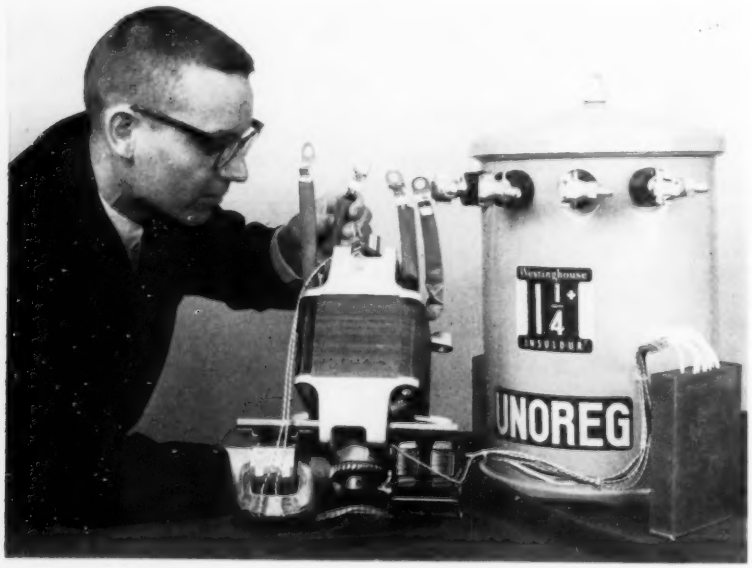
After approval by the city the detailed engineering was begun on the job. We first determined whether the mercury vapor lamp would present a heat problem in the existing luminaires and result in glass breakage. The type IV glassware was not a refractor, and the various manufacturers of the units assured us that we would not encounter a heat problem. Next, we checked the various style bases on the poles and found that they were too small to accommodate a ballast. It was then decided to install the ballast on the pole. A number of the poles had extensions on the top that were installed on the previous conversion and these extensions did not have adequate strength to support the additional weight of a ballast. By mounting the ballast about ten feet from the top of the pole, they could be attached to the bottom section of the pole which had adequate strength.

Practically all of the underground circuits were utilized and only the relaying had to be changed. A number of old oil switches were replaced with new multiple mercury switches for

(Continued on page 142)

New voltage regulation concept

Here a 1¼ Unoreg is installed with a 25-kva distribution transformer at the end of a residential feeder on a large utility system.



Shown here are the basic components of Unoreg, the new Westinghouse regulator designed for use on the low voltage side of standard distribution transformers. First unit available is rated 1¼ kva.

◆ A NEW SELF-CONTAINED automatic voltage regulator called Unoreg, for use on the low-voltage side of over 400 standard distribution transformers, is offered by the Westinghouse Electric Corporation. Rated at 1¼ kva, the new device will handle distribution transformer sizes up to and including 25 kva. In a few months a 2½-kva model will be available for use with transformers up through 50 kva.

A compact, lightweight design for convenient pole mounting, Unoreg provides plus and minus five per cent regulation of 120/240-volt secondary lines. The new universal voltage regulator offers flexibility of application and economy of equipment. Unoreg can be applied to a distribution transformer at a cost of only $150 plus installation costs.

Result of computer studies

Development of Unoreg started after computer studies of literally thousands of hypothetical systems led to two principal conclusions:

(1) The most economical system is the one that is built to operate without re-regulation.

(2) However, when re-regulation is necessary, it can be obtained most economically by raising the voltage on the whole system and then bucking down the voltage at the head of the feeder, as required, with regulators on individual distribution transformers.

Providing a suitable regulator inside the transformer leaves no choice for users but to stock two different types of distribution transformers. This amounts to multiplying the different distribution transformer kva ratings by the number of different voltages on that operating company's distribution feeders.

The logical choice was to place the regulator in a separate unit making one style applicable to a large range of distribution transformers with the regulator operating from the secondary voltage. This led to the development of Unoreg, the economical answer for solving a complete feeders re-regulation problem as well as for correcting spot and emergency situations.

Unoreg consists of an induction regulator controlled by a solid-state voltage-regulating control.

This induction regulator has a new stator design which eliminates the need for a tertiary winding. Greater rigidity is achieved by means of a yoke-shaft rotor construction rather than using a through-type shaft.

In keeping with the reliability of the induction regulator, the voltage control element is a static control which uses all solid-state components with no moving parts or contacts.

Unoreg smoothly corrects the input voltage without jumps or time delay by inducing a voltage in the series coils of the induction regulator which either adds to or subtracts from the input voltage.

The midpoint voltage setting of the regulator control is 122 volts, allowing for an average secondary drop of two volts. The control is designed so that the voltage is always corrected back to the center of the bandwith.

Encapsulated relay

For maximum accuracy, the control is temperature compensated and meets the accuracy requirements of a class II voltage-regulating relay as defined by NEMA standards. Encapsulation of the control makes it rugged, reliable, and tamperproof.

Laboratory tests show that every part of Unoreg is capable of operating for at least 20 years without failure. Data obtained from field tests indicate that the control range is held within the specified limit of plus and minus 1¼ volts.

The new device is only 21½ inches high and 12¼ inches in diameter. Installation is simplified by the use of a lifting eyebolt and a mounting bracket with standard twelve-inch bolt spacing. Unoreg has standard low-voltage distribution transformer bushings, color coded for quick and easy connection.

A totally new concept of distribution voltage regulation, Unoreg was specifically designed for solving voltage regulation problems through a system approach. In this type of application, the voltage is raised to the level needed by the large outlying areas, and then bucked down by regulators on transformers near the head of the feeder. However, many applications will be to boost low secondary voltages at the ends of long or heavily loaded feeders.

25 kv feeders in Jacksonville

By Cyrus Washburn

Chief Engineer
Jacksonville Electric Dept.
Jacksonville, Fla.

◆ THE DEVELOPMENT of a relatively low cost lighting arrester and cut-out for 27 kv operation in the distribution class has enabled us to take advantage of our existing 26 kv sub-primary feeders, which are grounded neutral, and utilize 14.4/25 kv distribution transformers connected phase to neutral, stepping down directly to 120/240 volt, so that we can eliminate the 4 kv transformation where it is advantageous to do so.

This is of advantage to serve concentrated loads, such as shopping centers, even in thickly settled parts of the city, as well as suburban areas of the country.

We have installed this system to serve the North Gateway Center in this manner from cluster mounted 14.4/25 kv transformers in the rear of the building, with overhead construction, as well as the new Lakewood Center. North Gateway required about 2,500 kva in transformer capacity, and Lakewood about 1,000 kva. The voltage regulation on this system is excellent.

We propose to serve the Phillips Highway Plaza with an underground 26 kv primary (at owner's expense) utilizing three-phase transformers mounted on concrete pads. There will be one 1,500 kva unit at 277/480 volts, three 750 kva, and one 500 kva unit at 120/208 volts.

As a result of our experience with the 14.4/25 kv distribution at North Gateway and Lakewood, we have now drawn a line around our 4 kv primary system, and we propose to serve all areas outside this line at 14.4/25 kv. We have already put this system in the Fort Caroline Club Estates development in the Arlington area.

Our standard transmission substations consist of a 20,000/33,000 kva tap changing transformer with two outgoing feeders of around 18,000 kva capability each at 26 kv. Each station is set up so that a second transformer can be added, with two more feeders as load requires. We have seven of these transmission stations in service.

Our standard distribution substation consists of a metal clad unit substation of 3,750/4,687 kva capacity, with load tap changing, and having two outgoing primary feeders of 2,300 kva each. Each feeder is protected by an air circuit breaker and complete phase and ground relaying. We received ten of these during 1959, and completed installation of six. This makes a total of 36 in service. We have 12 more ordered for delivery in 1960.

In recent years, in an effort to reduce outages due to storms, tree limbs, etc., we have gone to neoprene-covered line wire, up to 200-foot spans. Also, to improve appearance, we have adopted the triplex secondary as well as triplex service drops. Our standard secondary in a residential area is 1/0 aluminum triplex cable with the drops taken off about 18 inches from the poles, which not only improves the appearance, but provides more climbing and working space on the pole.

We are now going to 2/0 aluminum triplex cable, in the higher priced residential subdivision, in order to provide more capacity per home.

Service rules revised

Recent revisions of the rules and regulations pertaining to types of service provided, etc., contain several points that may be of interest to other utility engineers.

(1) Service for residential air conditioning has been changed from three-phase to single-phase, up to and including 5 hp. (However, the actual rule is phrased in terms of amperes, 32, since the manufacturers do not put hp or tons on the nameplate any more.)

(2) For loads estimated at 2,500 kva or more in the network area, we will now supply service at 277/480 volts.

(3) For loads estimated at 2,000 kva or more in the overhead area, we will now supply service at 277/480 volts.

(4) A circuit breaker of not less than 75,000 amperes interrupting capacity is now required on all

(Continued on page 141)

Conductor heat dissipation - 3

By Fred C. DeWeese
Consulting Engineer
Raleigh, N.C.

◆ IN THIS CONTINUATION of the series of articles on heat dissipation and current carrying capacity of electrical conductors, the data on heat dissipation by convection and radiation is applied to determine current carrying capacity of conductors. Also, the effect of conductivity on current carrying capacity is discussed. (Previous articles in this series appeared in the March and April, 1960 issues of ELECTRICAL SOUTH.)

Current carrying capacity

The current carrying capacity of an electrical conductor at a given temperature rise is

$$I = \sqrt{ALw/R} \qquad (3)$$

A = area of conductor surface per foot length.
L = length of conductor in feet.
w = $w_c + w_r$ = heat given off by the conductor—watts per sq. in.
R = resistance of conductor of length L at frequency f.

In solving for current carrying capacity of a wire or cable at a given temperature rise the resistance may be expressed in terms of any convenient length, the only stipulation being that L must be expressed in the same length as that for which the resistance is given.

For the 4/0 copper of Example 1, Table 2, "A" is given in Table 2, column (10) as 103,823 square inches per mile length of conductor. The heat w, given off by the conductor is computed to be 0.4284 watts per sq. inch. From Table 3, 70 degrees, R_{60} is given as 0.3168 ohm per mile. Substituting in equation (3) and solving

$$I = \sqrt{\frac{103{,}823 \times 0.4284}{0.3168}}$$

= 375 amperes at 60 cycles.

By the application of suitable multiplying factors, as indicated in

CORRECTION

An unfortunate error crept into the second article of this series appearing in the April 1960 issue of ELECTRICAL SOUTH. In both the third and fourth paragraphs on page 76, the word "conduction" should have read "convection."

Table 3 - Effective 60 cycle resistance of standard

Size AWG or MCM	Temperature Degrees C								
	0	5	10	15	20	25	30	35	40
8	3.0563	3.1215	3.1867	3.2519	3.3171	3.3822	3.4474	3.5126	3.5776
7	2.4238	2.4755	2.5271	2.5789	2.6306	2.6823	2.7340	2.7857	2.8373
6	1.9223	1.9633	2.0043	2.0452	2.0861	2.1271	2.1681	2.2091	2.2501
5	1.5243	1.5568	1.5893	1.6218	1.6544	1.6869	1.7194	1.7519	1.7844
4	1.2091	1.2347	1.2605	1.2863	1.3121	1.3378	1.3636	1.3894	1.4152
3	0.9589	0.9793	0.9998	1.0202	1.0406	1.0611	1.0815	1.1020	1.1224
2	.7606	.7768	.7930	.8092	.8254	.8416	.8578	.8741	.8903
1	.6154	.6285	.6416	.6548	.6679	.6810	.6940	.7071	.7202
1/0	.4883	.4987	.5090	.5194	.5298	.5402	.5506	.5610	.5714
2/0	.3875	.3958	.4040	.4122	.4204	.4287	.4369	.4451	.4534
3/0	0.3077	0.3142	0.3207	0.3273	0.3338	0.3403	0.3468	0.3534	0.3599
4/0	.2445	.2496	.2548	.2600	.2651	.2703	.2755	.2806	.2858
250	.2073	.2117	.2161	.2204	.2248	.2292	.2335	.2379	.2423
300	.1733	.1770	.1806	.1842	.1878	.1914	.1951	.1987	.2023
350	.1491	.1522	.1553	.1584	.1615	.1646	.1677	.1708	.1739
400	0.1310	0.1337	0.1364	0.1391	0.1418	0.1445	0.1472	0.1499	0.1526
450	.1170	.1194	.1218	.1242	.1266	.1289	.1313	.1337	.1361
500	.1058	.1080	.1101	.1123	.1144	.1165	.1187	.1208	.1230
550	.0968	.0987	.1006	.1026	.1045	.1064	.1084	.1103	.1123
600	.0892	.0910	.0928	.0945	.0963	.0981	.0998	.1016	.1034
650	0.08291	.08452	.08614	.08776	.08939	.09101	.09264	.09427	.09590
700	.07751	.07901	.08050	.08200	.08349	.08500	.08650	.08800	.08951
750	.07287	.07425	.07564	.07703	.07842	.07982	.08121	.08261	.08401
800	.06883	.07012	.07142	.07271	.07400	.07530	.07660	.07790	.07921
850	.06530	.06650	.06771	.06892	.07013	.07134	.07256	.07378	.07501
900	0.06217	.06330	.06444	.06557	.06671	.06785	.06899	.07014	.07129
950	.05940	.06047	.06153	.06259	.06366	.06474	.06582	.06690	.06798
1000	.05692	.05792	.05893	.05994	.06094	.06196	.06298	.06400	.06502
1250	.04769	.04847	.04925	.05003	.05080	.05159	.05238	.05317	.05396
1500	.04174	.04236	.04298	.04362	.04426	.04489	.04553	.04616	.04680
1750	0.03759	.03812	.03864	.03917	.03970	.04023	.04076	.04130	.04184
2000	.03451	.03497	.03543	.03589	.03635	.03681	.03726	.03772	.03818

Table 4 - Relative current carrying capacities of copper and copper alloys at a temperature of 65° C

Conductivity %	Capacity %	Conductivity %	Capacity %	Conductivity %	Capacity %	Conductivity %	Capacity %	Conductivity %	Capacity %	Conductivity %	Capacity %	Conductivity %	Capacity %
100	100.00	93	96.98	86	93.76	79	90.38	72	86.76	65	82.91	58	78.76
99	99.58	92	96.51	85	93.29	78	89.86	71	86.22	64	82.32	57	78.14
98	99.15	91	96.06	84	92.81	77	89.35	70	85.68	63	81.74	56	77.52
97.3	98.86	90	95.58	83	92.33	76	88.84	69	85.14	62	81.16	55	76.89
96	98.29	89	95.16	82	91.85	75	88.32	68	84.59	61	80.57	54	76.25
95	97.85	88	94.69	81	91.36	74	87.81	67	84.03	60	79.97	53	75.60
94	97.42	87	94.23	80	90.87	73	87.28	66	83.47	59	79.37	52	74.95

These tabulated data may be used in the following way: If a given current produces a certain temperature rise in an ideal conductor having 100 per cent conductivity, the current which will produce the same temperature rise in an actual conductor of some other per cent conductivity may be obtained by multiplying the given current by the value in the per cent capacity column (expressed as a decimal) corresponding to the per cent conductivity of the actual conductor. For example, calculations in a given instance indicate that a 4/0 copper cable having 100% conductivity will have a certain temperature rise when carrying 375 amperes. It will be found from the above table that a 4/0 copper cable having 95% conductivity will experience the same temperature rise when carrying 375 x 0.9785 = 367 amperes.

the denominator of the two equations given as a footnote to Table 2, values of "A" in columns (8) and (9) in the table may be used.

Effect of conductivity

The relative current carrying capacities of electrical conductors do not, as might be expected, vary directly with the conductivity, but inversely as the square root of the respective resistances. For example, the 60 cycle resistance of 4/0 copper, 100% conductivity, 65 degrees C., Table 3, is 0.3116 ohm per mile, and for hard drawn copper, 97.3% conductivity, it is equal to 0.3116 x 1.023* = 0.3188 ohm per mile, from which

* *This is not a constant multiplier. Its value varies with conductor temperature and skin effect ratio, a subject beyond the scope of this article.*

annealed copper wire and cable - ohms per mile

Size AWG or MCM	Temperature Degrees C								
	45	50	55	60	65	70	75	80	85
8	3.6430	3.7081	3.7733	3.8385	3.9037	3.9688	4.0340	4.0992	4.1644
7	2.8990	2.9407	2.9924	3.0441	3.0958	3.1475	3.1991	3.2508	3.3025
6	2.2911	2.3321	2.3731	2.4141	2.4551	2.4960	2.5370	2.5780	2.6190
5	1.8169	1.8494	1.8819	1.9144	1.9497	1.9794	2.0119	2.0444	2.0769
4	1.4410	1.4667	1.4925	1.5183	1.5441	1.5696	1.5956	1.6214	1.6472
3	1.1428	1.1633	1.1837	1.2042	1.2246	1.2450	1.2655	1.2859	1.3064
2	0.9054	0.9226	0.9388	0.9550	0.9712	0.9874	1.0037	1.0199	1.0361
1	.7333	.7465	.7596	.7727	.7858	.7989	0.8120	0.8251	0.8383
1/0	.5818	.5922	.6025	.6129	.6233	.6337	.6441	.6545	.6649
2/0	.4616	.4698	.4781	.4863	.4946	.5028	.5110	.5193	.5275
3/0	0.3664	0.3729	0.3794	0.3860	0.3925	0.3990	0.4056	0.4121	0.4186
4/0	.2910	.2961	.3013	.3065	.3116	.3168	.3220	.3272	.3323
250	.2466	.2510	.2554	.2597	.2641	.2685	.2728	.2772	.2816
300	.2060	.2096	.2132	.2169	.2205	.2241	.2278	.2314	.2350
350	.1770	.1801	.1832	.1863	.1894	.1925	.1957	.1988	.2019
400	0.1553	0.1581	0.1608	0.1635	0.1662	0.1689	0.1716	0.1743	0.1770
450	.1385	.1409	.1433	.1457	.1482	.1506	.1530	.1554	.1578
500	.1252	.1273	.1295	.1316	.1338	.1359	.1381	.1402	.1424
550	.1142	.1162	.1181	.1201	.1220	.1240	.1260	.1279	.1299
600	.1052	.1070	.1087	.1105	.1123	.1141	.1159	.1177	.1195
650	0.09753	.09917	.10081	.10245	.10409	.10574	.10737	.10901	.11066
700	.09102	.09253	.09406	.09557	.09708	.09860	.10012	.10164	.10317
750	.08541	.08681	.08822	.08963	.09103	.09245	.09387	.09527	.09669
800	.08052	.08183	.08314	.08445	.08577	.08709	.08840	.08972	.09104
850	.07623	.07745	.07868	.07991	.08114	.08237	.08362	.08485	.08609
900	0.07244	.07359	.07474	.07590	.07706	.07822	.07938	.08053	.08169
950	.06906	.07015	.07123	.07232	.07341	.07450	.07559	.07669	.07779
1000	.06604	.06706	.06809	.06911	.07015	.07118	.07222	.07325	.07429
1250	.05475	.05555	.05634	.05714	.05795	.05875	.05956	.06037	.06118
1500	.04745	.04810	.04874	.04939	.05004	.05069	.05135	.05200	.05266
1750	0.04237	.04291	.04345	.04399	.04454	.04508	.04563	.04617	.04672
2000	.03864	.03910	.03957	.04004	.04051	.04098	.04144	.04191	.04238

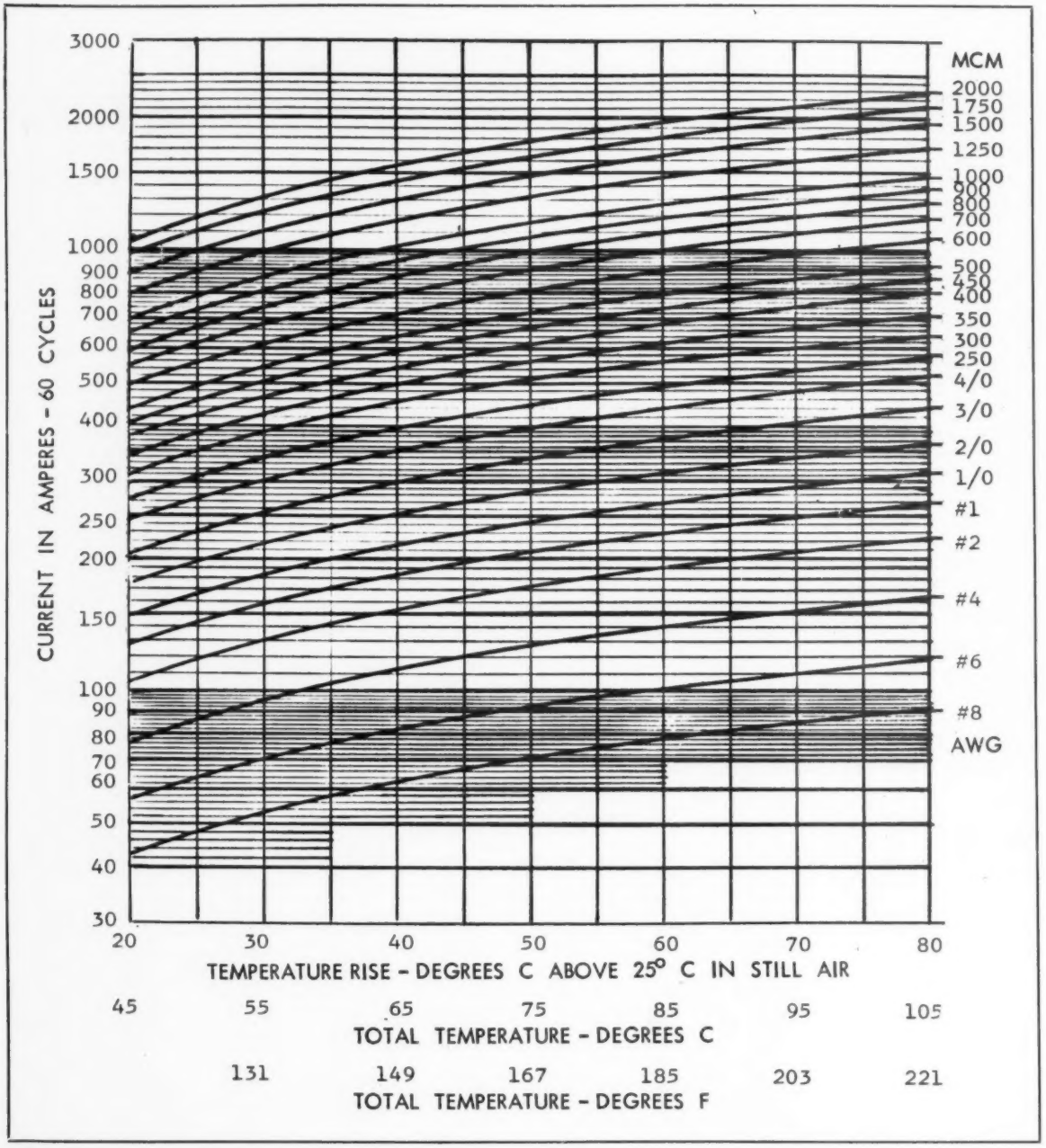


Fig. 4—Temperature-current curves for copper wire and cable.

$$\sqrt{\frac{0.3116}{0.3188}} = 0.9886 = 98.86\%$$

The relative current carrying capacities of copper and copper alloys at a temperature of 65 degrees C., covering a wide range of conductivities, are compiled in Table 4, (capacity % columns). While these table values were derived from the 60 cycle resistance of 4/0 copper, it should be pointed out that the current carrying capacity is virtually constant over the entire range of temperature and conductor sizes.

To use the heat loss values from which the curves were plotted for finding the current carrying capacity of a given conductor at a given temperature rise, proceed as follows:

Example 2: Let it be required to find the current required to produce a temperature rise of 55°C above 25°C still air, of a 400 MCM copper cable.

From Table 3, 400 MCM copper at $(25 + 55) = 80°$, $R_{60} = 0.1743$ ohm per mile. From Fig. 2, 55 degrees rise, 400 MCM copper w = 0.51 watts per sq. in. From Table 2, column (8), A = 2.279 sq. in.

(Continued on page 141)

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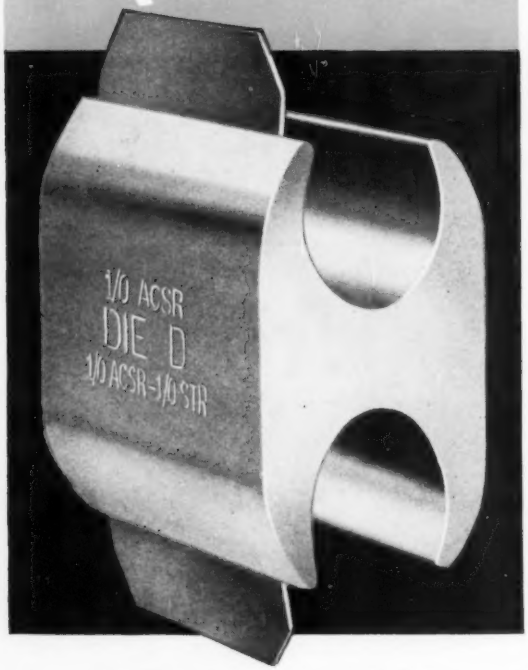

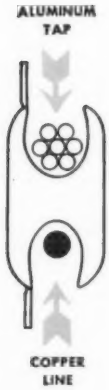

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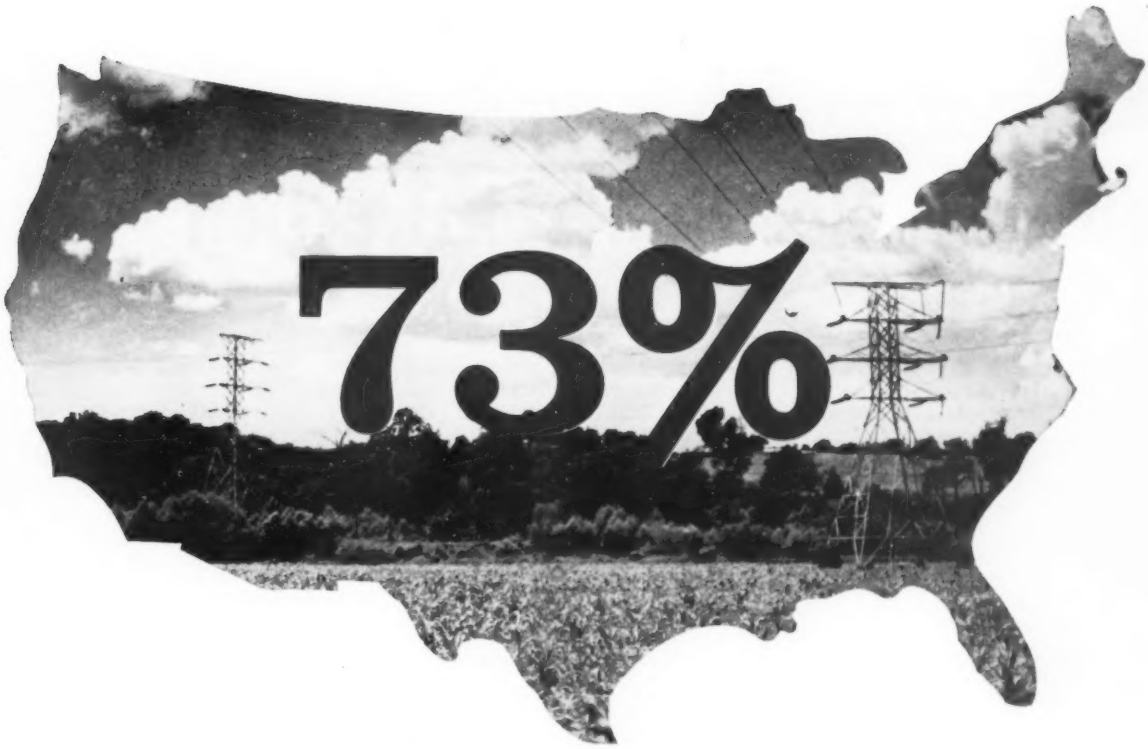

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Estimating labor unit data for outside electrical construction — 3

◆ ADDITIONAL tables are presented this month in the series covering man-hour labor units for outside electrical construction.

These are being published by special permission of Gulf Publishing Co., Houston, Tex., being part of their recently published book, "Estimator's Electrical Man-Hour Manual," by John S. Page and Jim G. Nation.

As explained in the first article which appeared in the March 1960 issue of ELECTRICAL SOUTH, the labor units given in these tables are based on average productivity efficiency. Copies of that first article, explaining the productivity factors and methods of evaluating the data will be sent to new readers upon request (Address request to The Editor, ELECTRICAL SOUTH, 806 Peachtree St., NE, Atlanta, Ga.)

Additional tables of labor units in this series will appear in the July issue of ELECTRICAL SOUTH.

All data presented in this article copyrighted 1959 by John S. Page and Jim G. Nation.

Fiber duct installation

Manhours per unit listed

Manhours include storing, handling, hauling, and installing in pre-excavated ditch to three feet deep.

Manhours do not include excavating or shoring. See respective tables for these charges.

Size	Item	Unit	Number of Ducts in Run				
			1	2	3	4	5 or More
2"	Duct	C Ft.	9.36	8.45	8.05	7.90	7.80
2-1/2"	Duct	C Ft.	9.57	8.97	8.70	8.45	8.30
3"	Duct	C Ft.	10.53	9.50	9.10	8.85	8.70
3-1/2"	Duct	C Ft.	11.05	10.00	9.62	9.50	9.35
4"	Duct	C Ft.	11.70	10.53	10.00	9.90	9.75
4-1/2"	Duct	C Ft.	12.35	11.05	10.65	10.53	10.30
2-1/2"	Bends	Each	1.56	1.56	1.56	1.56	1.56
3"	Bends	Each	1.70	1.70	1.70	1.70	1.70
3-1/2"	Bends	Each	1.80	1.80	1.80	1.80	1.80
4"	Bends	Each	1.95	1.95	1.95	1.95	1.95
4-1/2"	Bends	Each	2.10	2.10	2.10	2.10	2.10
2-1/2"	Elbows	Each	1.30	1.30	1.30	1.30	1.30
3"	Elbows	Each	1.40	1.40	1.40	1.40	1.40
3-1/2"	Elbows	Each	1.50	1.50	1.50	1.50	1.50
4"	Elbows	Each	1.60	1.60	1.60	1.60	1.60
4-1/2"	Elbows	Each	1.75	1.75	1.75	1.75	1.75

Cement asbestos duct installation

Manhours per unit listed

Manhours include storing, handling, hauling, and installing in pre-excavated trench to three feet deep.

Manhours do not include excavating or shoring. See respective tables for these charges.

Size	Item	Unit	Number of Ducts in Run				
			1	2	3	4	5 or More
2"	Duct	C Ft.	10.40	9.35	9.00	8.85	8.70
2-1/2"	Duct	C Ft.	10.65	9.90	9.60	9.35	9.25
3"	Duct	C Ft.	11.70	10.55	10.10	9.90	9.75
3-1/2"	Duct	C Ft.	12.35	11.20	10.65	10.50	10.40
4"	Duct	C Ft.	13.00	11.70	11.20	11.05	10.80
4-1/2"	Duct	C Ft.	13.65	12.35	11.80	11.70	11.45
2-1/2"	Bends	Each	1.70	1.70	1.70	1.70	1.70
3"	Bends	Each	1.80	1.80	1.80	1.80	1.80
3-1/2"	Bends	Each	1.95	1.95	1.95	1.95	1.95
4"	Bends	Each	2.10	2.10	2.10	2.10	2.10
4-1/2"	Bends	Each	2.20	2.20	2.20	2.20	2.20
2-1/2"	Elbows	Each	1.30	1.30	1.30	1.30	1.30
3"	Elbows	Each	1.45	1.45	1.45	1.45	1.45
3-1/2"	Elbows	Each	1.55	1.55	1.55	1.55	1.55
4"	Elbows	Each	1.70	1.70	1.70	1.70	1.70
4-1/2"	Elbows	Each	1.80	1.80	1.80	1.80	1.80

Clay duct installation

Manhours per unit listed

Manhours include storing, handling, hauling, and installing in pre-excavated ditch to three feet deep.

Manhours do not include excavating or shoring. See respective tables for these charges.

Item	Unit	Single Duct	Multiple Ducts					Multiple Split Ducts				
			2	3	4	6	9	2	3	4	6	9
3-1/4" Duct	C Ft.	14.30	14.95	15.60	16.25	16.90	18.85	16.90	17.55	18.20	18.85	20.80
3-1/2" Duct	C Ft.	14.95	15.60	16.25	16.90	18.85	20.80	17.55	18.20	18.85	20.80	22.75
4-1/4" Duct	C Ft.	15.60	16.25	16.90	18.85	20.15	22.10	18.20	18.85	20.80	22.10	24.05
4-1/2" Duct	C Ft.	16.25	-	-	-	-	-	-	-	-	-	-
3-1/4" Bends	Each	2.10	-	-	-	-	-	-	-	-	-	-
3-1/2" Bends	Each	2.35	-	-	-	-	-	-	-	-	-	-
4-1/4" Bends	Each	2.60	-	-	-	-	-	-	-	-	-	-
Slants-1 Hole	C	19.50	-	-	-	-	-	-	-	-	-	-
Slants-2 Hole	C	20.80	-	-	-	-	-	-	-	-	-	-
Slants-3 Hole	C	22.10	-	-	-	-	-	-	-	-	-	-
Slants-4 Hole	C	23.40	-	-	-	-	-	-	-	-	-	-
Slants-6 Hole	C	24.70	-	-	-	-	-	-	-	-	-	-
Slants-9 Hole	C	29.90	-	-	-	-	-	-	-	-	-	-

Lead covered cable

Manhours per hundred feet

Manhours include storing, handling, hauling, and installing cable in conduit.

Manhours do not include excavation, shoring, installation of conduit, or make-up of connection. See respective tables for these charges.

Size	One Conductor	Size	Three Conductor
	Manhours		Manhours
6	4.50	3-14	4.50
4	5.55	3-12	5.40
2	6.30	3-10	7.05
1	6.75	3-8	9.15
1/0	7.05	3-6	11.10
2/0	7.65	3-4	13.20
3/0	8.10	3-2	15.00
4/0	8.70	3-1	18.00
250 MCM	10.50	3-1/0	20.10
350 MCM	12.00	3-2/0	22.05
500 MCM	14.25	3-3/0	24.75
-	-	3-4/0	27.00

Direct burial cable

Manhours per hundred feet

Manhours include storing, handling, hauling, and placing.

Manhours do not include excavating, shoring, or splicing. See respective tables for these charges.

Size	One Conductor	Size	Three Conductor
	Manhours		Manhours
14	1.05	3-14	1.95
12	1.20	3-12	2.00
10	1.36	3-10	2.70
8	1.80	3-8	4.05
6	2.00	3-6	4.70
-	-	3-4	5.40
-	-	3-2	6.75
-	-	3-1	9.00
-	-	3-1/0	11.40
-	-	3-2/0	12.15
-	-	3-3/0	12.75
-	-	3-4/0	15.00
-	-	3-250 MCM	16.50

Cable splicing

600 volt, type RL wire

Net manhours each

Manhours include make-up of splice only.

Manhours do not include excavation or cable installation. See respective tables for these charges.

Size	One Conductor	Size	Three Conductor
	Manhours		Manhours
6	3.30	3-14	3.00
4	3.75	3-12	3.75
2	4.20	3-10	4.50
1	4.50	3-8	5.25
1/0	4.95	3-6	7.80
2/0	5.25	3-4	8.25
3/0	5.63	3-2	10.50
4/0	6.00	3-1	12.00
250 MCM	6.75	3-1/0	13.50
350 MCM	7.50	3-2/0	15.00
500 MCM	8.25	3-3/0	18.00
-	-	3-4/0	19.50

ENGINEERED INTO BLACKBURN'S COMPRESSION CONNECTORS

High Conductivity-

Blackburn has engineered all compression connectors shown to fit your present tooling program—and added advantages to meet engineers' and linemen's requirements.

Type SH

Type HT Prefilled

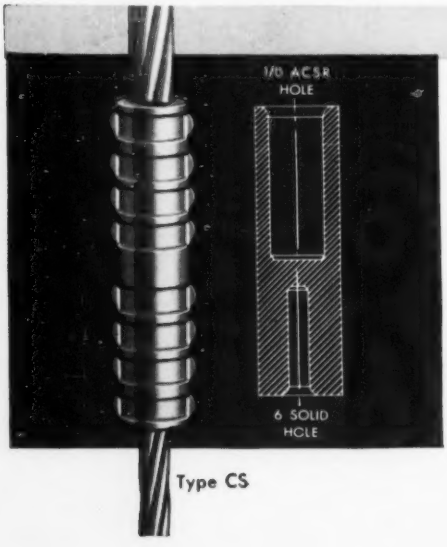
Type SH Prefilled

Type HT

Standardization now possible with Blackburn "H" frame connectors

- **Designed to fit the tools you already have for applying "H" frame type connectors.**
- **Full length tab completely seals out moisture, easiest to bend and install!**
- **Surface treated to improve conductivity and retard corrosion.**
- **Prefilled with Blackburn's superior oxide-inhibiting compound. Contax, in easy-tear tab vacuum package.**
- **Color fast, large, easy-to-read lettering.**
- **Type HT is reversible, both grooves "open". For large aluminum tap to smaller copper main. Also used for dead ending.**

Licensed under U.S. Patent No. 2,707,775.



Type CS

You get higher conductivity with Blackburn service entrance sleeves

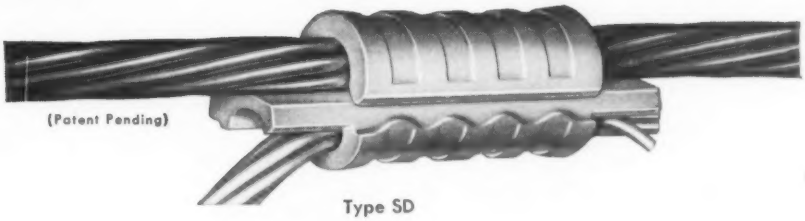
Blackburn—and Blackburn *alone*—provides greater contact area where needed, to assure greater conductivity. This is accomplished by increasing hole depth as the diameter of the conductor is increased, thereby providing more contact area for the conductors being connected.

The Color Coding is *printed* for quick, positive identification.

The sleeves' ends are sealed with Aluminum Sensitized Tape, which is easy to puncture . . . and, if a particle of the seal is pushed into the chamber, the particle is conductive.

Contax, Blackburn's superior oxide-inhibiting compound, is already in these sleeves *in measured amount.* Won't squirt out on glove or in face. And the solid center stop in a Blackburn Sleeve assures proper distribution of the inhibitor around the conductors. Designed for tooling you have.

High "Use-Ability"

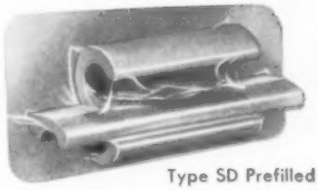


(Patent Pending)

Type SD

Exclusive drip-guard separator in Blackburn 6-frame tap connector gives *extra* protection to bi-metallic connections

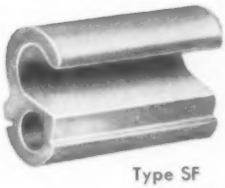
- Spacer allows SD Connector to be used for bi-metal connections with the tools you already have for "C" Frame type connectors.
- An economical substitute for "L" taps, since extended drip guard gives extra insurance against corrosion products bridging the bi-metallic gap.
- A true *two-handed* connector, very adaptable for hot line work.
- Surface treated for highest conductivity and corrosion resistance.
- Prefilled with Blackburn's Contax and vacuum packed for insurance against corrosion.



Type SD Prefilled

Type SF

- Recommended for aluminum to aluminum.
- Spacer gives better protection against strand breakage.
- Can be installed with same tooling used for Type SD.
- Prefilled with Blackburn's Contax and vacuum packed for insurance against corrosion.



Type SF

Type TR

Blackburn neutral repair sleeves save dollars on triplex services

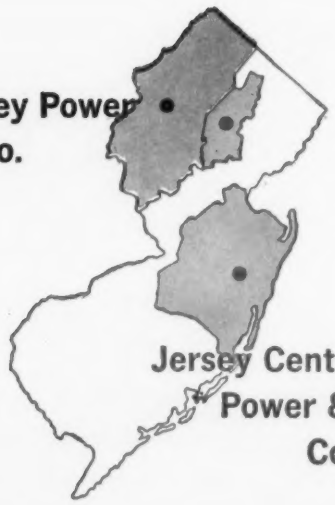
- Salvage short lengths of pre-assembled service drop cable with Blackburn Sleeves.
- Designed for and tested with the tools you already have.
- Extra length engineered for neutral pullout values in keeping with dead end devices.

See JB Catalog 858 for Tooling INFORMATION

LIVE BETTER ELECTRICALLY

JASPER BLACKBURN CORPORATION

1525 Woodson Rd., St. Louis 14, Mo. • WYdown 3-9430



Emergency crew working in driving rain to restore service in Asbury Park. Outages caused by series streetlighting wires snapping in high winds have now been eliminated by conversion to multiple individual control.

Two Progressive Utilities Reduce Storm Outages with F-P Individual-Lamp Controls

Conversion by Jersey Central Power & Light Co. and New Jersey Power & Light Co. from series to multiple individual photoelectric streetlight controls, many of them Fisher-Pierce Series 6600A units, has eliminated some tough problems brought on by severe weather. Since 1954 New Jersey has experienced a succession of hurricanes (that year there were three in six weeks) and unusually fierce winter storms, which caused series wires to snap in high winds and under the weight of ice. Other lines were being shorted by these broken wires, or had to be cut for safety when repairing the streetlight wires. The result was many service interruptions and plenty of headaches. Individual controls—and elimination of the series wire — provided the answer.

In 1957 these utilities embarked on a progressive relighting and conversion program that has reached completion in certain areas. Every street in Asbury Park, for example, conforms to IES lighting standards, and every lamp is individually controlled. Because poles have been cleared of several hot elements, pole work is simplified. And the danger of fires from high voltage leaks due to broken series wires — a particular problem where there is damp, salty air — has also been eliminated.

Down with the old... Up with the new...

New, brighter streetlight equipped with Fisher-Pierce Series 6600A control replaces series street light as part of JCP&L and NJP&L conversion program. Short time delay in the F-P control permits fast checking and effectively prevents false turn-off by lightning – no cases have been reported to these utilities. All streetlights in Asbury Park (below) are individually controlled.

For complete design information and specifications on Series 6600A controls, write The Fisher-Pierce Co., 59 Pearl Street, So. Braintree 85, Massachusetts.

FP

FISHER PIERCE

PHOTOELECTRIC LIGHTING CONTROLS

AN AFFILIATE OF SIGMA INSTRUMENTS, INC.

This CHANCE Fuse

waves a RED FLAG to signal Capacitor Failure!

... Prevents tank rupture

The Chance CTS Fuse for secondary systems gives you positive operation with a distinctive signal of capacitor failure. When the fuse element melts, the indicator flag springs away from the cartridge automatically ... stands out like a sore thumb so linemen and patrol crews can easily spot a failed capacitor from the ground. The fuse is equally effective on upright or underhung capacitors, and the flag works regardless of the position or angle of the fuse.

The fuse element is precision made and well protected by the rugged construction of the cap-sealed fuse tube. You get no false outages, but you do get instant isolation of failed capacitors to protect secondary systems *and prevent hazardous tank rupture.*

Ideal protection for banked secondary systems

Chance Secondary Fuses, used between banked transformer secondaries, permit only one transformer and its load to be taken out of service if a secondary fault occurs. This prevents possible damage to the other transformers, or cascading of the fuses protecting these transformers.

You can get complete information, and performance curves of the CTS or CTSI (Insulated Leads) Fuse, by contacting your Chance Man or writing direct.

CF60-23

A. B. CHANCE CO.

CENTRALIA, MISSOURI

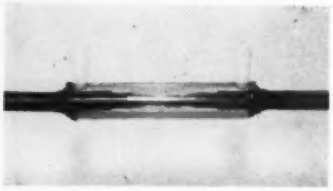
(A. B. Chance Company of Canada, Ltd., Toronto)

New utility equipment

Transparent splicing molds

"Scotchcast" brand splicing kits for epoxy resin encapsulation of inline cable splices have been supplied with transparent plastic molds, providing a means of visual inspection when making splices. The kits are made by the Minnesota Mining and Mfg. Co., St. Paul 6, Minn.

The new molds, because of their transparency, assist workmen in positioning the mold over the splice and reduce the possibility of air pockets and voids in the resin.



Other features of the splicing kits remain the same, utilizing as the insulator "Scotchcast" brand resin No. 4 in the "Unipak" container, the key to fool-proof mixing of epoxy resin in the field. This splicing method makes it possible to complete high voltage splices in the field without specialized training.

The kits are recommended for use on all common unshielded, single conductor cable splices rated 5 kv and under; for positive sealing and splicing of multiple conductor control and communication cables, and for sealing and insulating single conductor cable terminations rated 5 kv and under, either shielded or non-shielded.

Write U-609 on reply card, pg. 17

Pengo pole-mount tensioner

With tension rating increased to 1,000 pounds line pull and maximum conductor capacity raised to 397,500 cm AAC, an improved model of the popular portable Pengo 4000 PM pole mount tensioner is now in production by Petersen Engineering Co., Inc., of Santa Clara, Calif.

This latest development in Pengo's line of tension stringing equipment employs the same principle as Pengo's larger tensioners of multi-grooved neoprene lined double bull-wheels. Every possible weight-saving feature is incorporated, so that the complete tensioner is entirely portable. It can be carried on any truck to the job site, easily lifted off by two men, and quickly attached to a pole to string any size conductor to 397,500 cm AAC.

In order to keep the weight to the barest minimum for ease of handling, a number of the castings are of magnesium, the lightest useable metal.

With a rating of any tension to 1,000 pounds line pull, the new 4000 pole mount tensioner is so designed that the input fair-lead swings to either side so that stringing operations can take place in either direction, even though the pole may be immediately next to a fence or a building.

Write U-610 on reply card, pg. 17

Three new aerial ladders

A complete line of aerial ladders has been announced by Truck Equipment Co., Denver 5, Colo.

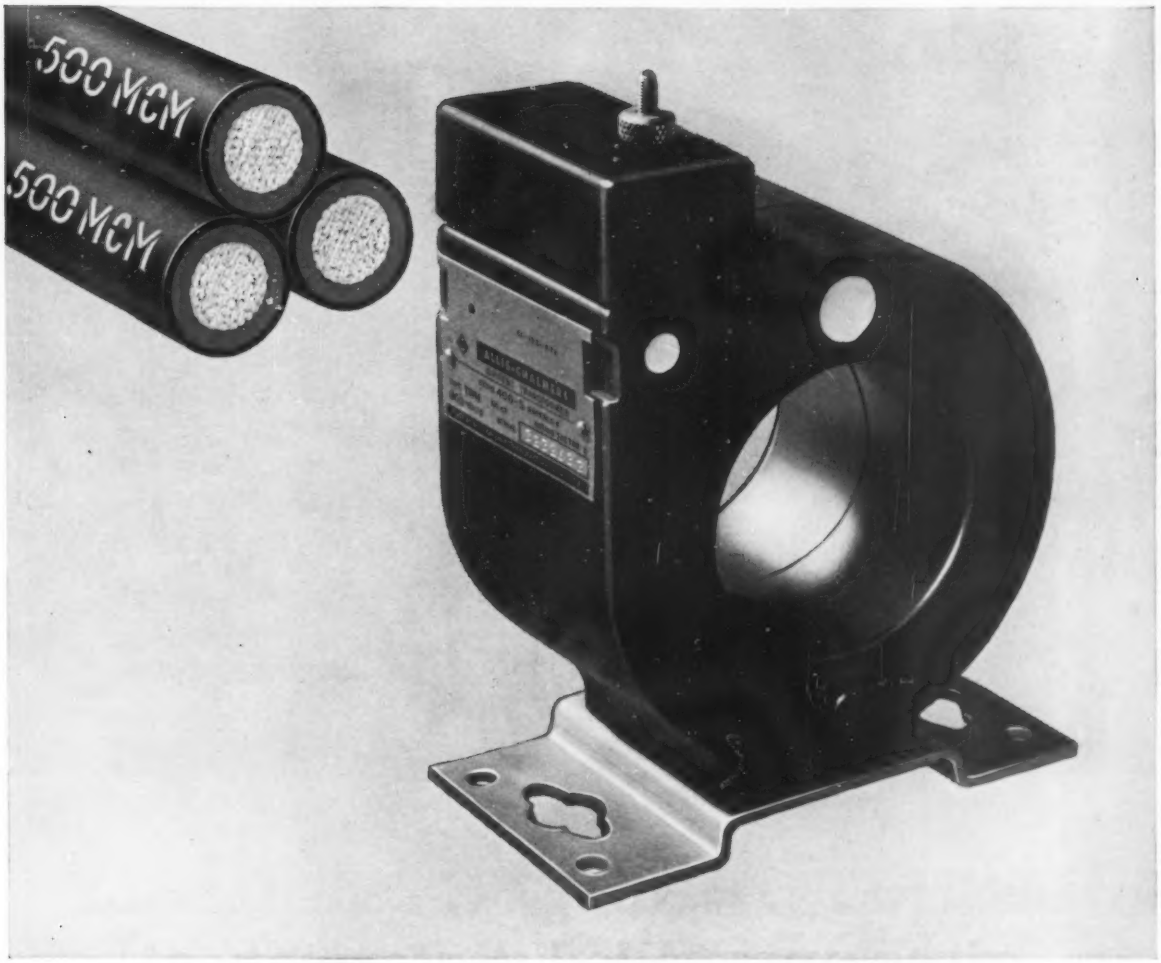
The new line, which includes three new series, was developed for use by power companies, city street and stop-light maintenance crews, tree surgeons, telephone companies, building contractors and others who need a safe, efficient means of performing overhead work.

Features include upper ladder section handrails built into fiberglass to insulate workers from high voltage contact, a tri-plane basket to give workers a flat surface regardless of ladder angle, a check valve in the hydraulic raise system to slow descent of the ladder if the hydraulic system is damaged and ladder heights from 24 to 45 feet.

The Truco manual aerial ladder (TML Series) uses sturdy counterbalance springs to absorb 70 per cent of the weight in raising the ladder. A hand-operated hydraulic system furnishes needed power to raise the ladder. Rotation through 360 degrees is accomplished through use of low-friction bearings in the pedestal, gear box and hand crank. Ladder locks in any desired position of raise or rotation.

Write U-611 on reply card, pg. 17

ALLIS-CHALMERS



Lightest weight with largest window

and the best accuracy available on the market today

The NEW Allis-Chalmers "PICTURE WINDOW" current transformer can easily take three 500 MCM cables.

Compact, easy to install, indestructible and weatherproof — this 600-volt epoxy-resin transformer will withstand wide temperature variations and the most severe mechanical shocks. Eliminates all possible maintenance.

Easily adapted for conduit-type hookup, A-C current transformers can be used on 2 or 3-wire, single and polyphase circuits. Ratings: 200, 400, 600 and 800 amperes.

Get full details on this NEW TWM current transformer from your nearby A-C office. Or write **Allis-Chalmers,** *Power Equipment Division, Milwaukee 1, Wisconsin.*

A-1310

Verified accuracy! Certified test card accompanies every A-C unit shipped. This A-C design provides ample overcurrent capacity without reduction of accuracy.

Steady plant production demands dependable power cable . . .

HABIRITE-HABIRPRENE CABLE gives unexcelled performance!

To help assure uninterrupted production, modern industrial plants require reliable cables for delivering electric power to production lines. The service reliability of Phelps Dodge *Habirite-Habirprene* is unsurpassed by any other rubber insulated neoprene jacketed type RR cable.

Habirite-Habirprene is a combination of specially engineered butyl rubber insulation and neoprene jacket. The overall features of this cable provide greater resistance to heat, oxidation and ozone; improved electrical properties, including superior insulation resistance; higher copper operating temperature; superior flexibility; improved mechanical toughness against damage from installation hazards and extra resistance to corona, an absolute necessity for high-voltage neoprene jacketed cable.

As a general purpose cable, *Habirite-Habirprene* assures the utmost in safety, durability and reliability.

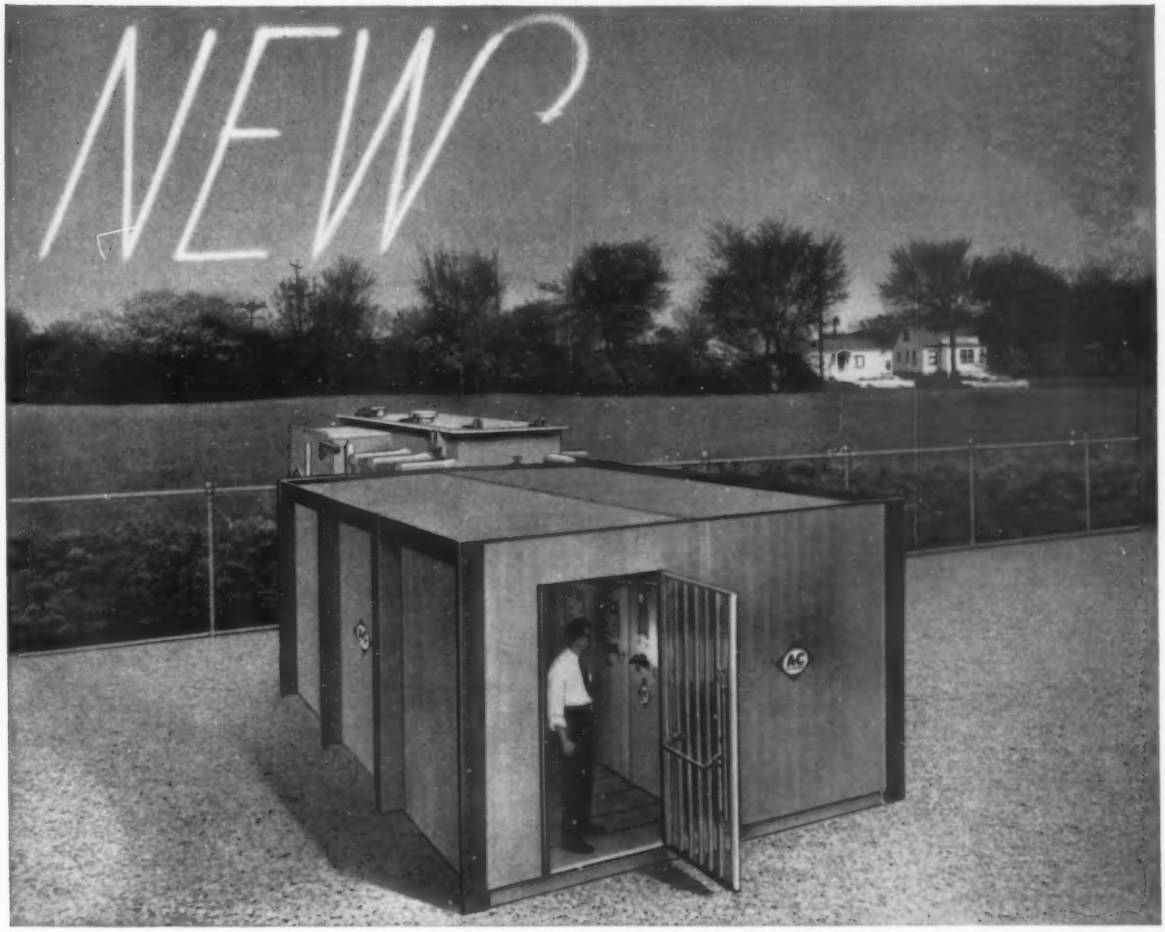
See Your Phelps Dodge Distributor!

PHELPS DODGE COPPER PRODUCTS CORPORATION

PD

SALES OFFICES: Atlanta, Birmingham, Ala., Cambridge, Mass., Charlotte, Chicago, Cincinnati, Cleveland, Dallas, Dayton, Denver, Detroit, Fort Wayne, Greensboro, N.C., Houston, Indianapolis, Jacksonville, Kansas City, Mo., Los Angeles, Memphis, Milwaukee, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, Portland, Ore., Richmond, Rochester, N.Y., San Francisco, St. Louis, Seattle, Washington, D.C.

ALLIS-CHALMERS



New Aluma-Clad switchgear combines long-range economy with

styling for the sixties

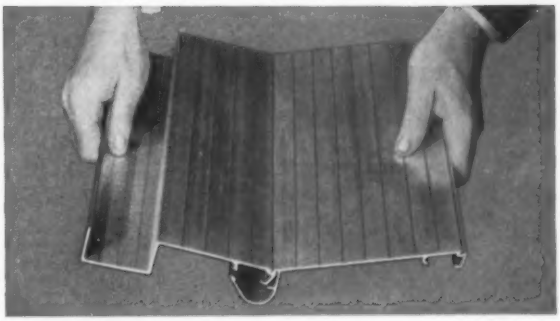
Lasting beauty, long-range economy. You get both with new *Aluma-Clad* switchgear enclosure.

Modern, functional design makes this an innovation welcome in any neighborhood. Ribbed, all-aluminum exterior is soft finished to prevent offensive glare. Color-anodized trim enhances its beauty.

Painting is completely unnecessary! *Aluma-Clad* switchgear can't rust. Its aluminum exterior resists corrosion from salt air and contaminated atmospheres.

Low installation costs! Lightweight aluminum sections dramatically reduce installation time, labor cost. Panels bolt together with aluminum alloy bolts and neoprene gasketing. Because of the unit's light weight and unusual rigidity, simple concrete piers can be used instead of heavy slabs.

Contact your nearby A-C office for complete details on *Aluma-Clad* switchgear, or write **Allis-Chalmers,** Power Equipment Division, Milwaukee 1, Wis. A-1283



Interlocking modular panels snap together to form a permanent leak-proof joint. Extruded vertical joint sections, every six inches, act as reinforcement — provide exceptional rigidity.

Aluma-Clad is an Allis-Chalmers trademark.

Need Copperweld Ground Rods or Clamps in a hurry? Just contact any of the following Pole Line Hardware Manufacturers or their Jobbers—located from coast to coast. They have large stocks available for quick delivery to you.

A. B. CHANCE COMPANY
210 N. Allen St., Centralia, Mo.

HUBBARD AND COMPANY
200 S. Michigan Ave., Chicago 4, Ill.

JOSLYN MFG. AND SUPPLY COMPANY
155 Wacker Dr., Chicago 6, Ill.

LINE MATERIAL INDUSTRIES
700 W. Michigan St., Milwaukee 1, Wis.

OLIVER ELECTRICAL MFG. COMPANY
170 Angell St., Battle Creek, Mich.

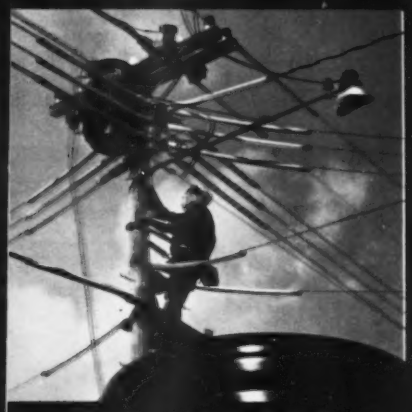
Millions of Copperweld Ground Rods—the only molten-welded rods—are in use protecting billions of dollars worth of equipment.

COPPERWELD STEEL COMPANY
WIRE AND CABLE DIVISION *Glassport, Pa.*
For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, N.Y.

GENERAL ELECTRIC ANNOUNCES...

A NEW METHOD OF TRANSFORMER RATING

DEVELOPED SPECIFICALLY TO LET
YOU TAKE FULL ADVANTAGE OF
THE BENEFITS OF GENERAL ELECTRIC'S
PERMALEX INSULATION



DISTRIBUTION TRANSFORMERS

NETWORK TRANSFORMERS

MEDIUM TRANSFORMERS

General Electric's new rating method gives you higher kva ratings, with full operating life, at no extra cost.

GENERAL ELECTRIC

Using General Electric's new transformer rating method, you utilize

Greater kva capacity with Permalex* insulation

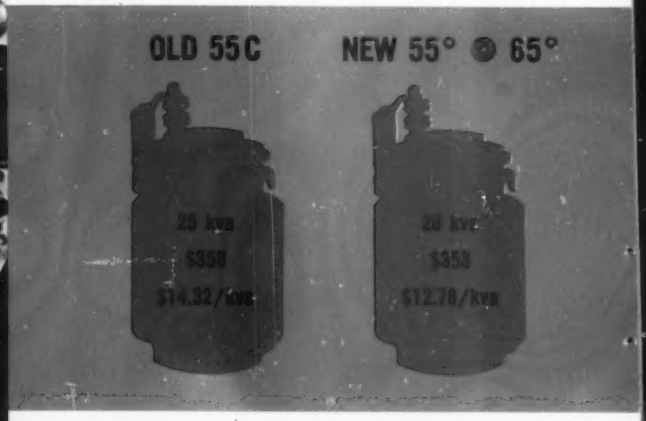
Permalex insulation was developed in G-E laboratories, and reported to the industry in AIEE paper TP-60-58 over a year ago. But standard rating systems have not permitted some users to fully realize the benefits of this outstanding insulation system — until today.

Now General Electric announces a NEW method of rating transformers, specifically designed to let you take maximum advantage of the higher kva capacity possible with Permalex insulation.

An additional higher kva rating now appears on G-E oil-filled distribution and network transformers.

*Trademark of General Electric Company

GENERAL ELECTRIC'S PERMALEX insulation gives you more kva — at lower cost-per-kva. Photo at left shows new 55° ◉ 65° label which identifies G. E.'s new dual-kva distribution transformer.



For example — a transformer formerly rated 25 kva is now rated 25/28 kva — indicating that you get the full benefits of a 28 kva unit from a General Electric transformer ASA-rated at 25 kva.

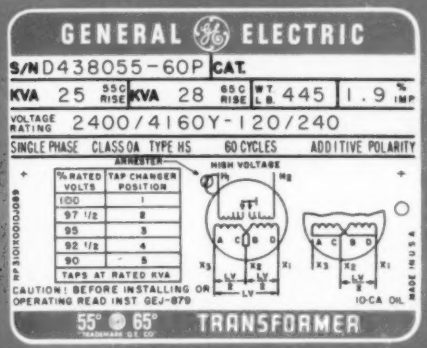
The nameplate is labeled **55° 65°** to show the corresponding average winding rises associated with these two kva ratings. Here are sample ratings: 50 kva is now 50/56; 250 kva is now 250/280; and 750 kva is now 750/840 kva. Permalex insulation enables you to base your transformer utilization on the higher load and temperature with no sacrifice in transformer life.

Using the new higher kva rating, you can now apply the full benefits of Permalex insulation *according to your established loading practices.* Since you get more kva capacity at no price premium, you can realize substantial savings on cost-per-kva.

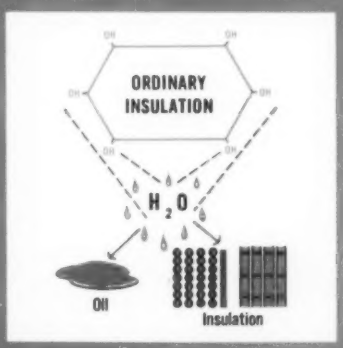
Your General Electric Sales Engineer can give you a dollars-and-cents breakdown of the actual savings *you* can get. Contact him today, or write for bulletin GEA-7047 to Section 482-05, General Electric Company, Schenectady 5, New York.

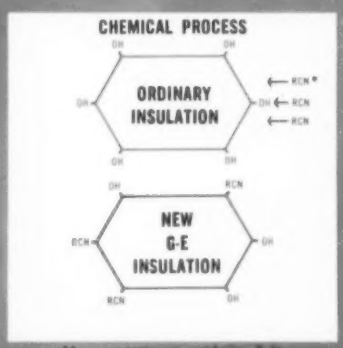
GENERAL ELECTRIC

NEW NAMEPLATE shows ASA standard 55C rise kva rating, plus General Electric's new kva rating based on 65C rise — made possible by Permalex insulation.



HERE'S WHY Permalex insulation allows transformer operation at 65C winding rise. Chemically modified insulation in G-E Permalex system drastically reduces formation of water which attacks turn and layer insulation in ordinary systems.





FULL-VALUE
CERTIFIED
TRANSFORMER
GENERAL ELECTRIC

- Superior design, features, and performance
- Faster shipment
- Complete service

HERE ARE THE NEW RATINGS

	55C Self-Cooled	65C Self-Cooled	65C Fan-Cooled
1φ	833 kva	933 kva	1073 kva
	1250 kva	1400 kva	1610 kva
	1667 kva	1867 kva	2147 kva
	2500 kva	2800 kva	3500 kva
	3333 kva	3733 kva	4666 kva
	5000 kva	5600 kva	7000 kva
3φ	750 kva	840 kva	966 kva
	1000 kva	1120 kva	1288 kva
	1500 kva	1680 kva	1932 kva
	2000 kva	2240 kva	2576 kva
	2500 kva	2800 kva	3500 kva
	3750 kva	4200 kva	5250 kva
	5000 kva	5600 kva	7000 kva
	7500 kva	8400 kva	10500 kva

Permalex insulation now used in G-E medium transformers

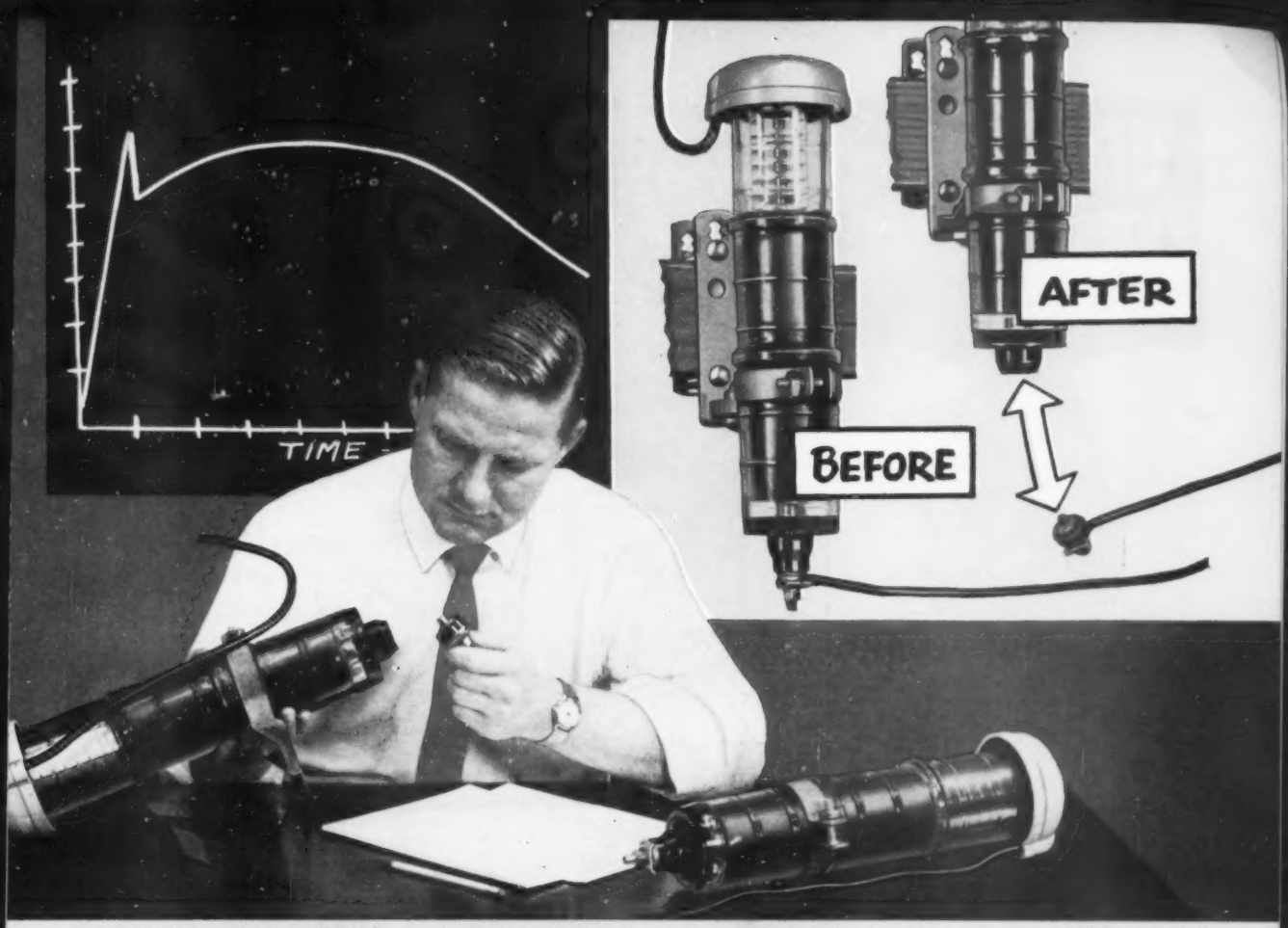
General Electric now extends the use of Permalex insulation to medium transformers to give you 12 percent higher kva with continuous operation at 65C rise. You get this bonus kva at no price premium — and with no loss in transformer life expectancy.

For example — a G-E medium transformer with Permalex insulation, formerly rated by ASA at 5000 kva, 55C rise, can now be operated at 65C rise and 5600 kva with normal life. If you operate the transformer at ASA rating you get five times longer life. In addition, standard fan-cooled rating increments can be applied at 65C rise operation.

Your General Electric Sales Engineer has specific information on the savings you can realize with the new higher kva ratings — another Certified Full-value feature of General Electric medium transformers. Give him a call, or write for detailed information to Section 482-05A, General Electric Company, Schenectady 5, New York.

Progress Is Our Most Important Product

GENERAL ELECTRIC



Above: at left the L-M Type E-3 9kv arrester. At right, the same arrester after the Isolator has been made to operate by deliberately failing the arrester with a high overvoltage. The Isolator disconnects the ground instantly so that the back-up device does not lock out and permanently disconnect a whole section. And the disconnected ground lead is easily seen. Lightning Arrester Engineer F. Schultz examines the Isolator.

The "Isolator" On L-M Arresters Positively Prevents Line Lockout

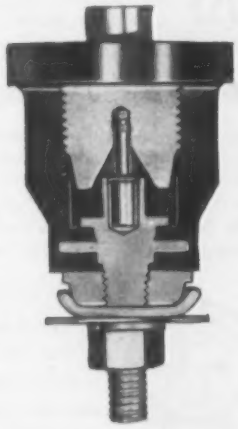
One utility company that has kept accurate records reports that in 167,410 L-M arrester-service years, over 12 years, there were only 59 Isolator operations in service. This is a truly remarkable record. Probably only L-M Valve arresters could have established such a low failure rate—three-hundredths of one percent!

Those 59 Isolator operations indicated arrester failure from whatever cause—direct strokes, overvoltage, or other causes. Without the Isolator, the feeder could have been grounded, and the back-up protective device locked out. Crews would have been out, trying to find the faulty arrester—not an easy task—and a costly one.

The L-M-Isolator instantly cut off the ground; and the disconnected ground lead could be easily seen by a line crew.

The Isolator was originated by L-M. It has been in service more than 20 years. The Isolator has definite time-current characteristics, so that a definite amount of heat from follow current is required to operate the Isolator. It operates any time that the arrester fails, or is about to fail.

The Isolator is only one of many superior features of L-M Valve Type arresters. Ask the L-M Field Engineer for details, and a copy of L-M's paper, "Lightning Arrester Application". Or write Line Material Industries, Milwaukee 1, Wisconsin. In Canada: CLM Industries, McGraw-Edison (Canada) Limited, Toronto 13, Canada.



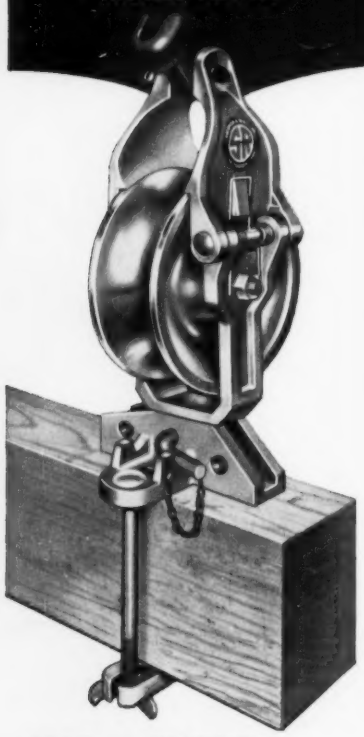
Cutaway view of L-M's insurance device, the Isolator. Should a shorted gap or clinkered element permit follow current to continue to flow, the heat operates the Isolator instantly, before the back-up device can lock out. The time is controlled by the time-current characteristics of the Isolator. This prevents a faulty arrester from grounding feeders, cuts hunting time and service outages.

LM® **LINE MATERIAL® Industries**
McGRAW-EDISON COMPANY
458
Lightning Arresters
McGRAW EDISON

DISTRIBUTION TRANSFORMERS · RECLOSERS AND OIL SWITCHES · FUSE CUTOUTS AND FUSE LINKS · LIGHTNING ARRESTERS · POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS · CAPACITORS · REGULATORS · OUTDOOR LIGHTING · LINE CONSTRUCTION MATERIALS · PORCELAIN INSULATORS · FIBRE PIPE & CONDUIT

S&R Universal Stringing Sheave

MODEL XS-100



USE on CROSSARM as shown

USE on ANGLE for cornering block

USE without BRACKET to suspend from insulator stringing

Light weight, adjustable bracket, tough aluminum alloy throughout, safety locking, wide throat and anti-friction bearings. Grooved for cable through 1 ¾" diameter. Designed especially for ACSR.

NEW CATALOG

on complete line of S&R Conductor Stringing Equipment sent on request.

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100 FIRST STREET

CHATTANOOGA 2, TENNESSEE

Telephone AMherst 7-1273

TWX CT-7036

Reverse-power relay

A NEW directionally-controlled timing relay (type CRN-1) for reverse-power, three-phase applications is available from the Westinghouse Electric Corp., Box 2278, Pittsburgh, Pa.

The CRN-1 relay is rated 120 volts line-to-line, five amperes. The main contacts can close 30 amperes at 250

volts d-c and carry this current for sufficient time to trip a circuit breaker.

Some of the features of this new relay include high sensitivity of 0.02 amperes, 120 volts at maximum torque, adjustable timing range from 2.0 to 40 seconds, small-size Flexitest case, and low burden. The relay is completely self-contained.

Write U-612 on reply card, pg. 17

Two new polyphase meters

ADDITION of two new polyphase meters has completed the V-60 meter family from General Electric Co., 1 River Rd., Schenectady 5, N. Y.

Both new models — the V-65 and V-66—are class 200 meters designed to measure polyphase loads up to 200 amperes without the need for instrument transformers.

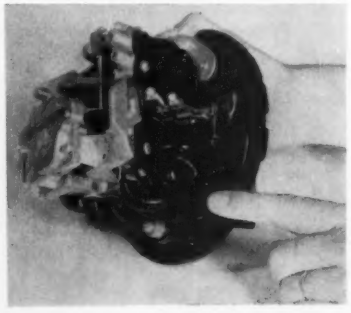
Designed for four-wire delta operation, the V-66's rated speed is 8⅓ rpm with 60-ampere turns in the current coil. It has a watthour constant of 28.8, a register ratio of 6 17/18, and a maximum temperature rise of 55°C at 200 amperes.

The V-65 three-phase meter is designed for the circuit obtained from a bank of three power transformers connected in wye.

Incorporating the same basic design as the I-60 electromagnetic assembly, the new meters are equipped with a new current-coil design which cent of test amperes with straight- enables them to handle up to 667 per line accuracy. Improved accuracy is achieved by magnetic isolation of the current circuit from the potential circuit.

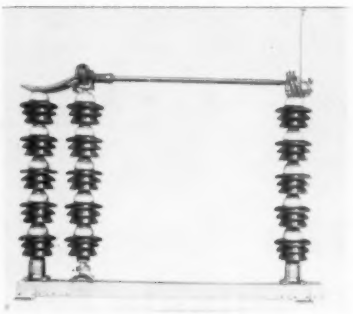
Both the V-65 and V-66 are available for either bottom or socket connections.

Write U-613 on reply card, pg. 17



High voltage power switch

A NEW 230-kv, 900-kv BIL, vertical break switch extends the line of power switches from Line Material Industries, McGraw-Edison Co., 700 W. Michigan, Milwaukee 1, Wis. Type PV2, 1,200-ampere switches are available for outdoor, group operation in horizontal, vertical, or inverted mounting position. The new switches have a momentary rating of 40,000 and 61,000 amperes.



They feature ease of operation and positive action under adverse conditions for sectionalizing, disconnecting, and bypassing application. PV2 switches meet all NEMA specifications.

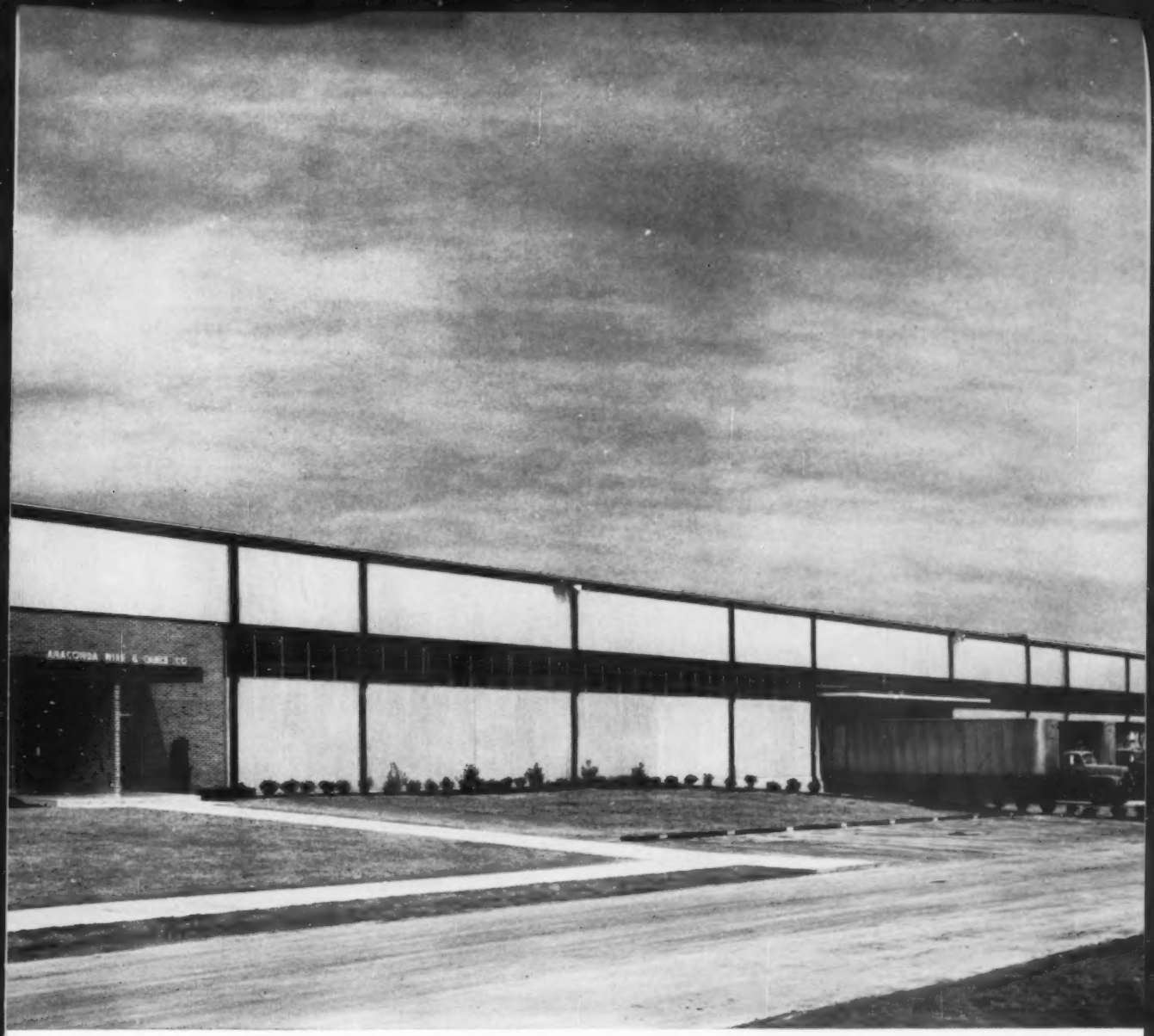
Other features include permanent lubrication, high-pressure contacts, individually aligned insulator stacks, universal mounting base, and flexible inter-phase mechanism.

Write U-614 on reply card, pg. 17

Brad rust inhibitor compound

A universal rust inhibitor compound that gives long-lasting corrosion protection to new metals, fabricated parts, machinery and tools, and all other forms of iron and steel with a single easy, low-cost application has been developed and is now being marketed by Brad Chemical, Inc., Chicago, industrial chemicals manufacturer.

(Continued on page 108)



The modern wire and cable plant to serve the dynamic South

We have served the South for many years, and we have been proud to share in this region's unprecedented growth.

Now, this new Anaconda Wire & Cable Company plant will provide the way to even better service – thanks to its modern manufacturing and storage facilities and central location.

In fact, everything in this operation has been designed to give you wire and cable products of highest quality and deliver them to you FAST by truck or rail.

In addition, the complete research and engineering facilities and the varied manufacturing skills of the entire Anaconda Wire & Cable Company are available to – and stand behind – the new Watkinsville plant, an expression of Anaconda's pride to be part of the dynamic South.

60263

Anaconda Wire & Cable Company
Southern District Sales Offices
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SEE THE MAN FROM

ANACONDA®

FOR ELECTRICAL WIRE AND CABLE

MOLONEY DISTRIBUTION TRANSFORMERS ARE DESIGNED TO MEET ALL SYSTEM REQUIREMENTS

Comparative analysis of distribution transformers invariably leads to one conclusion . . . the best distribution transformer has all characteristics of design carefully developed in respect to their contribution to system efficiency, dependability and economy.

In Moloney Distribution Transformers, no one feature, electrical or mechanical, is radically improved at the expense of another. Instead, each part of the design is carefully considered and balanced with the others, to provide a distribution transformer that will give the best all-around system performance.

Utility systems benefit from this philosophy of design because every Moloney Distribution Transformer feature is designed to perform in the best possible manner compatible with every other aspect of the design, and thus provide "More Power To You."

Desirable Features of Moloney Distribution Transformers Include . . .

High Short Circuit Strength
Mechanical Strength
Weatherproof
Corrosion Resistant
AL-CU Connectors
No Radio Interference

Here Is How They Are Achieved.

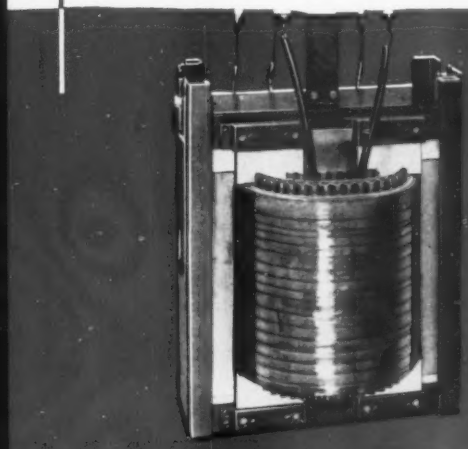
SUPERIOR PERFORMANCE BECAUSE...

MOLONEY ELECTRIC CO.

Since 1896 . . . ***MORE POWER TO YOU***

1 High Short Circuit Strength

All turns are anchored into position and resin-coated layer insulation is used throughout the coil. During the coil drying process this resin bonds the adjacent paper and wire together but does not keep the oil from penetrating all insulation. Steel frames secure wood blocks which press against the stayback on both top and bottom of the coil to hold it rigidly in position.



4 Corrosion Resistant

All materials used for Moloney tanks and accessories are especially selected for their resistance to corrosion and the tank, cover and base are painted with a tough, flexible weather resistant paint. The tank and cover are of heavy gauge metal and all connectors, clamps and other hardware are made of alloys which are relatively impervious to weather. All bushing mounting hardware is located internally, thus removing several possible sources of corrosion.

SALES OFFICES IN ALL

2

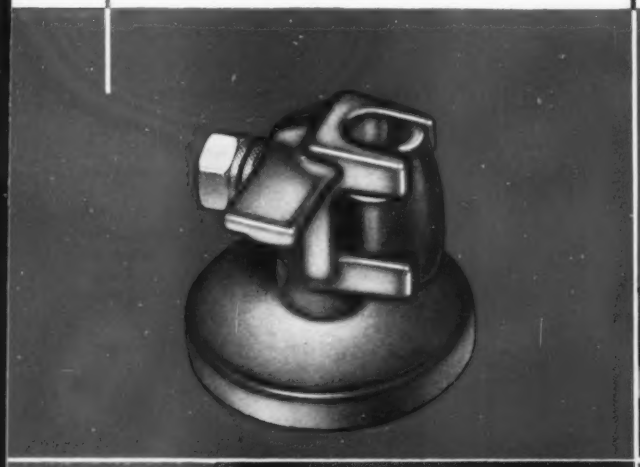
AL-CU Connectors

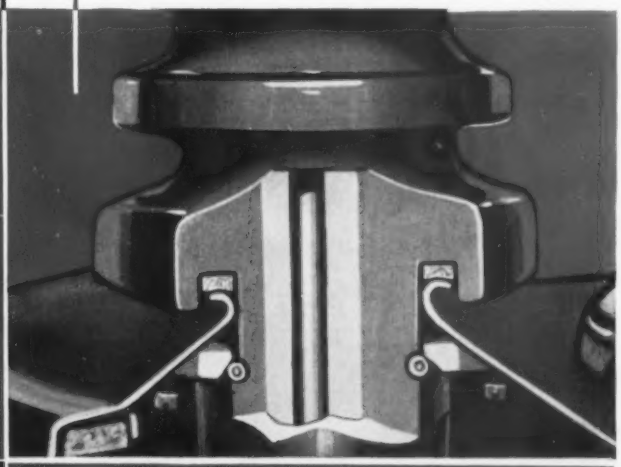
The solderless connectors are electro-tin coated and are designed to accommodate either the copper conductors specified by EEI-NEMA Standards or the ACSR equivalent. The large contact surface reduces conductor cold flow and the double-coil, spring-type washer compensates for any cold flow which may occur. Connectors are made of silicon bronze alloy to prevent twisting or breaking.

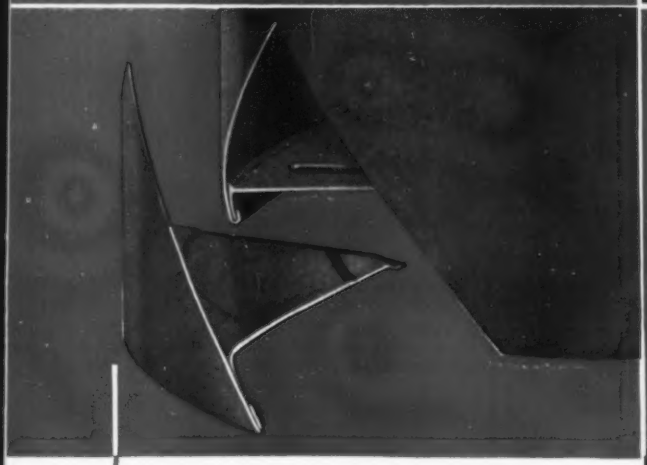
3

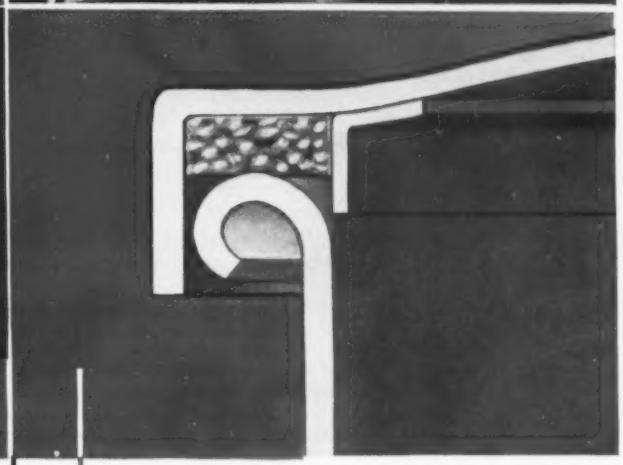
No Radio Interference

On voltages up to 15 KV the high voltage bushing boss is rolled to prevent the formation of corona at the point where the bushing passes through the cover. At higher voltages a conductive glaze and mounting adapter is combined with the rolled boss to prevent corona. These practices render Moloney Transformers free from potential sources of radio interference.









5

Mechanical Strength

The tank, cover, bushings and other components are designed to resist damage in shipment, handling or installation.

The metal used in the tank and cover is heavy gauge, copper bearing steel formed to give added strength at the points most susceptible to damage, especially at the tank base flange, where there is a triple thickness of metal.

All bushing corrugations have a thick vertical cross section to give the bushing high impact strength.

6

Weatherproof

To assure that the transformer is sealed from the atmosphere and the elements, bushing openings have retained corprene gaskets; cover bushings are mounted on rolled bosses whose flanges curve up and away from the opening; a corprene cover gasket seats on the rolled top rim of the tank and is retained by the rim, cover overhang, and an internal gasket retainer. The cover gasket remains in the cover when cover is removed from the tank and therefore will not stretch out of shape necessitating replacement.

ME60-5

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OF

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FIGURE 8

Pole & Bracket Cable

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Measure quality any way you like, you'll find that SUPERIOR Figure 8 Pole and Bracket Cable for multiple systems is tops!

Insulated with the highest quality polyvinyl chloride, SUPERIOR'S Figure 8 Cable does not deteriorate with age or weather, will not support combustion, is not affected by common chemicals or electrolysis and maintains its high insulation resistance when wet.

More than that . . . it is tough and highly resistant to abrasion and mechanical damage, yet is flexible and strips clean which speeds installation.

Available with 10 AWG solid copper or aluminum conductors, overall diameter .20 x .396; 8 AWG stranded copper conductors, overall diameter .28 x .560; 8 AWG solid aluminum conductors, overall diameter .28 x .560. Standard reel length is 2500 feet.

For performance and economy . . . top quality SUPERIOR Figure 8 Pole and Bracket Cable is your buy for multiple systems!

For complete information and prices, write

SUPERIOR CABLE

SUPERIOR CABLE CORPORATION

Hickory, North Carolina

4709

Called "Poly-Rustex", the new preparation is a special combination of active materials dispersed in an oil carrier base. The exclusive ingredients penetrate deeply through existing corrosion to the bare metal and form a solid air-and-moisture-tight seal, thus preventing formation of new rust. Poly-Rustex will not discolor the metal, yet provides complete protection that will not wash or wear away under normal conditions.

Poly-Rustex comes ready to use without mixing, and can be easily and quickly applied to any metal surface by a variety of methods: brush, spray, mop or dip.

Write U-615 on reply card, pg. 17

TWM current transformer

A new lightweight epoxy resin current transformer (Type TWM) for indoor-outdoor light-duty metering has been introduced by Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

Designed in four current ratings—200:5, 400:5, 600:5, and 800:5 amperes—this current transformer is compact and can be mounted vertically,

horizontally or in an inverted position. The window openings of the highest current rating can accommodate two 750 MCM or three 500 MCM insulated cables.

Primary and secondary polarity marks are permanently cast in the transformer. Secondary terminals on top of the transformer are protected by a weather-resistant sealable cover.

The transformer is easily adapted for conduit type hook-up and can be used on two or three wire, single and polyphase circuits. It meets all requirements of NEMA standards for metering current transformers for low voltage circuits, Type IV.

Write U-616 on reply card, pg. 17

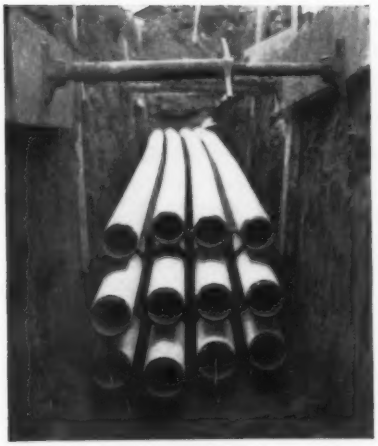
Kearney fiberglass clampstick

A new fiberglass shotgun stick recently announced by the James R. Kearney Corp., St. Louis 10, Mo., features bright yellow color permanently molded in to make the stick easy to see in any light, under any sky, or

Get peak cable protection ***at lowest dollar cost***

Transite Ducts can be laid directly in trench without concrete envelope. Or if ductbank is to be concrete enclosed—thinner walled Transite Duct may be used. In all other respects both heavy-wall and thin-wall Transite Ducts are identical.

Transite Ducts save on the job and after!



No other duct material gives you so many installation and in-service economies

In every way, Transite® Ducts are the most efficient electrical ducts you can install. And—when assembled with J-M's Plastic Coupling—their cost is remarkably low!

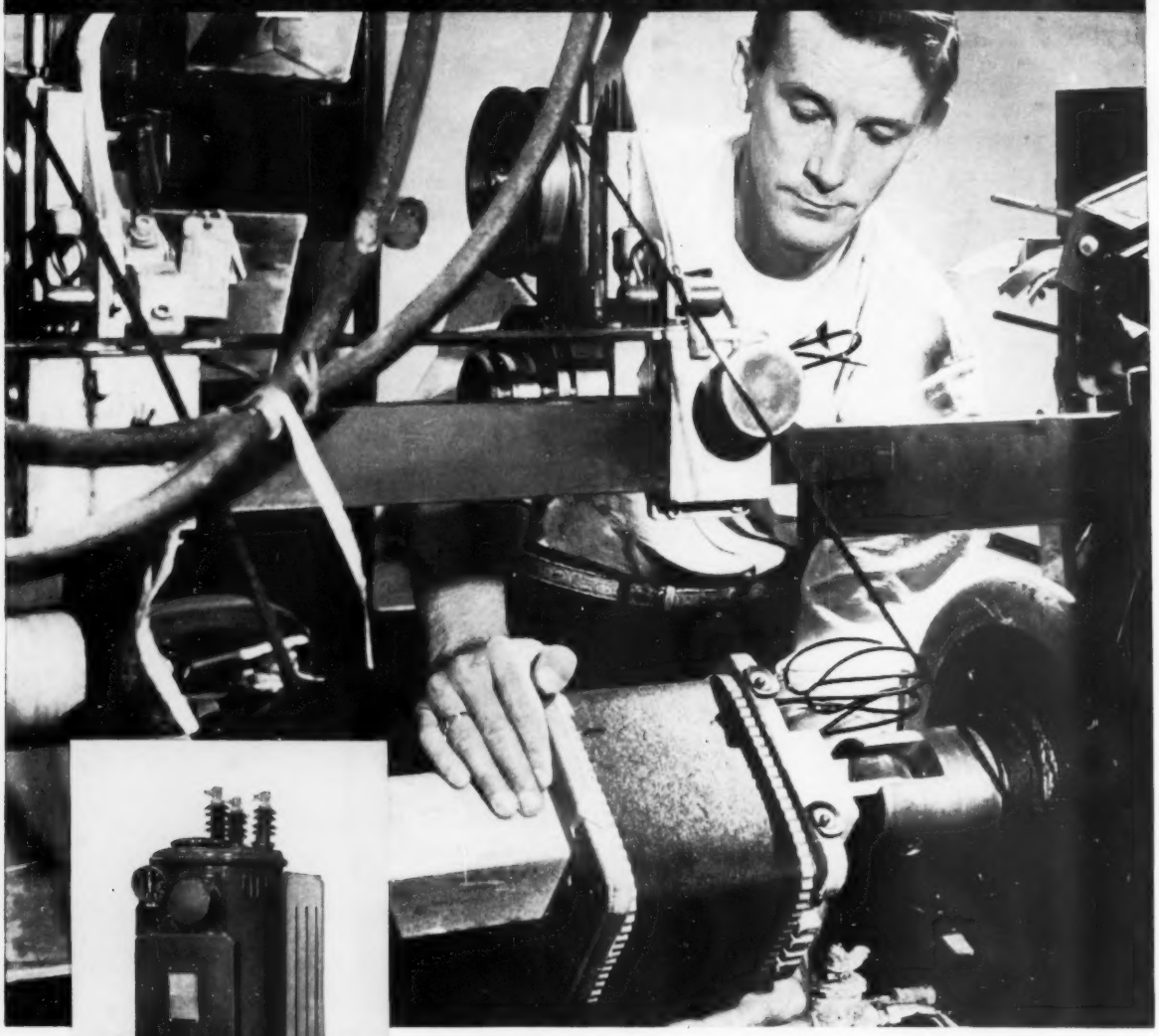
One reason for this economy is in installation. Strong, lightweight, long—Transite lengths are easy to handle and install . . . Your men set the ducts in place easily, join them tightly in seconds. Transite's smooth bore is free of burrs and obstructions. Thus, long cable pulls are easily accomplished with no damage to cable sheathing.

You see another reason for Transite's economy in performance. Once in service, Transite's unusually high rate of heat dissipation means cables run cooler, last longer. Transite also confines arc damage . . . cannot burn, smoke or fume. It won't generate explosive or toxic gases. If arcing does occur, Transite Ducts won't sag or adhere to cable.

Let us send the Transite Duct brochure EL-29A. Write Johns-Manville, Box 14, New York 16, N. Y. In Canada, Port Credit, Ontario.

JOHNS-MANVILLE JM PRODUCTS

ANOTHER STEP AHEAD IN VOLTAGE REGULATION



NEW Permalex Insulation

Permalex* coil insulation in General Electric voltage regulators boosts reliability—lengthens regulator life

New Permalex insulation—another regulator first from General Electric—is now standard on all G-E ML-32 single-phase, step voltage regulators. Permalex makes possible added regulator economies through longer core and coil life and greater reliability—at no price premium.

Permalex insulation preserves high dielectric strength because of the special cyanoethylation of its kraft insulation paper. This process, exclusive with General Electric, retards formation of moisture released by cellulose materials under load—slows aging process of insulation to give you longer regulator life. Permalex insulation is fully compatible with other regulator components and provides a true *system* approach to regulator design.

Another outstanding G-E regulator feature which increases quality, Permalex insulation gives you more regulator for your money. It is, in fact, another reason why *G-E regulators cost less on the line.*

Ask your General Electric regulator representative for more information about Permalex-insulated ML-32 regulators—as well as the entire line of G-E voltage regulators. Or, write to Section 456-03. General Electric Company, Schenectady 5, N. Y.

*Trade-mark of General Electric Company

Progress Is Our Most Important Product

GENERAL ELECTRIC

Wanted: Manuscripts for publication

The editors of Electrical South will welcome contributions from the field for publication. Electrical contractors, consulting electrical engineers, light and power company engineers, and others closely associated with the electrical industry are invited to submit articles, photographs, and drawings relating to important and interesting electrical projects in the South and Southwest.

Articles are wanted in two principal classifications:

***Wiring and Lighting:* Articles on interesting and unusual electrical installations; any phase of electrical contracting such as business promotion, estimating, handling men and materials, etc.**

***Utility Engineering:* Articles relating to any phase of transmission, distribution, and metering, including design, installation, testing, and maintenance. These articles should be "by-line" articles carrying the name of a Southern or Southwestern light and power company.**

All articles will be given careful consideration and payment will be made promptly for all material accepted for publication.

Address all communications to the editor:

Electrical South
806 Peachtree,
Atlanta 8, Ga.

in the beam of a spotlight at night. The new stick, of high dielectric strength fiberglass, has been tested to withstand 100 kv per foot for 5 minutes. The yellow, non-porous surface instantly shows up soil, dirt or grease which might cause excessive or dangerous leakage, can be wiped "safety-clean" in seconds, and requires no costly refinishing.

Smoothly-operating rod mechanism is fully enclosed and protected, has only 3 moving parts that cannot bind, stick, or otherwise get out of adjustment. The clampstick can be quickly and completely disassembled for easy cleaning in the field by removing only one screw. Stick is equipped with an extra-strength bronze 3/4 hook, a thumb latch, a safety stop to prevent accidental opening of the hook, and a wing-screw locking device. Available in 4, 6, 8, 10 and 12 foot lengths, one-piece or hinged type.

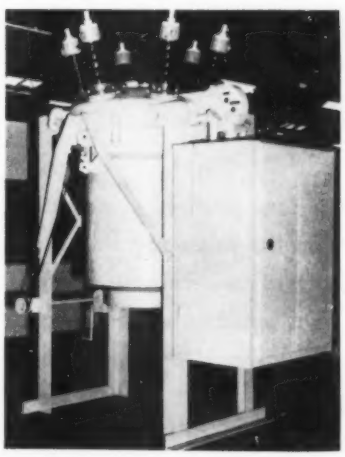
Write U-617 on reply card, pg. 17

I-T-E single-tank oil breakers

The Power Circuit Breaker division of I-T-E is introducing a new line of single-tank oil breakers in the subtransmission ratings—14.4 kv, 23 kv, 34.5 kv, and 46 kv, with mva from 500 to 1500. Called the "I-T-E Trend-Line", these breakers incorporate a new "Kool-Arc" vertical interrupter, which permits all three phases to be safely contained in a single tank.

Although all phases are contained within a single steel tank, adequate clearances and special tank liners and phase barriers ensure equal or better protection than that afforded by three-tank designs, according to I-T-E engineers. The new breakers provide five-cycle interruption and twenty-cycle reclosing as standard performance.

The new design offers shorter arcing time, reduced oil contamination and contact erosion. With only one tank to service, from thirty to eighty gallons less oil is used than with three-tank designs and main-



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Fine Fanner Superformed Products

"Superforms* help me keep lines in service" ... DISTRIBUTION ENGINEER

"To me, the word 'Superformed' means a number of plus values:

"*Service continuity* to keep our customers satisfied . . . *low maintenance costs* . . . in short, *greater dependability* and *savings*."

Everywhere, Distribution Engineers . . . *the men technically responsible for keeping customer lines in service* . . . acclaim Fanner Superforms.

A-1886A

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Superformed with a
"PROTECTIVE TWIST"

ARMOR RODS . . . Protect long-span T&D lines at supports

LINEGUARDS . . . Protect short-span T&D lines at supports

PATCH RODS . . . Repair damaged conductors

TAP ARMOR . . . Protects conductor at tapping points

FANNGRIPS . . . For dead-ending strands and conductors

FANNSPLICES . . . Join two ends of conductor wire

PLASTIC PRODUCTS . . . For conductor surface protection

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Brookside Park—Cleveland 9, Ohio
Division of Textron, Inc.

Koenig ALL-STEEL UTILITY BODIES

LINE-CONSTRUCTION BODY

. . . available in 9' to 14'6" lengths with mechanical or hydraulic winch and derrick, or any other special or custom equipment desired. Compartments can be arranged to your specifications.

SERVICE BODIES

. . . for ½-, ¾-, and 1-ton chassis. Electrically welded into one unit with six waterproof compartments, recessed paddle handles keyed alike and fender skirt protected with die-formed rolled edges. Built for safe, dependable service . . . will outlast several chassis.

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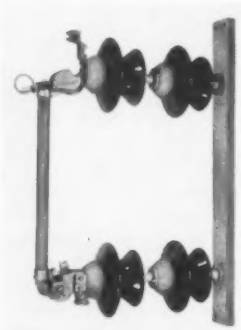
tenance time is cut by 20 per cent. Also the dropping of the single tank permits easy access to all internal parts.

Write U-618 on reply card, pg. 17

Southern States power fuses

Southern States recently announced a new line of power fuses designated the Types BPA and HPA. The new fuses supersede the Types BP, MP and HP fuses and offer such operating improvements as fiberglass fuse holders, improved latching, provisions for easier handling with



a hookstick, and Amplitact contacts to eliminate damage from high, short circuit currents.

The Type BPA is available in voltage ratings from 7.2 kv - 69 kv, continous ratings of 100 and 200 amperes, and interrupting ratings as high as 934,000 kva in some ratings.

The Type HPA is available in voltage ratings from 7.2 kv - 161 kv, continuous ratings of 100, 200, 300, and 400 amperes, and interrupting ratings as high as 3,480,000 kva.

Write U-619 on reply card, pg. 17

Hubbard 200 ampere cutout

A new 200 ampere open drop-out cutout, featuring their exclusive single-vent, small-bore design is now available from Hubbard and Co., Chicago 4, Ill.

The cutout's single-vent operation confines the arc-expulsion gases to a small cone in the downward direction, eliminating the danger of "shrapnel" and conducting gases being blown into the overhead structure. The cutout's small-bore maximizes the pressure of these expulsion gases and guarantees rapid clearing of low faults.

The Hubbard 200 ampere cutout has interrupting capacities of 12,000 amperes at 7.8-kv and 10,000 amperes at 15-kv. These ratings are made possible by an exclusive thrust-absorbing recoil mechanism and fiberglass fuse tube.

Another new development in 200 ampere cutout operation is the roll action fuse-ejector. This offers a positive means of ejecting one-, two-,

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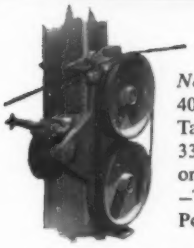

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8-15

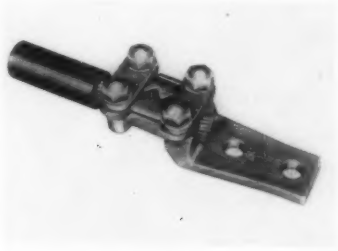
and three-leader fuse links in the 100 to 200 ampere range—thus preventing any possibility of restriking an arc during fault interruption.

Write U-620 on reply card, pg. 17

Fargo power connectors

Fargo Mfg. Co., Inc. of Poughkeepsie, N. Y. announces a line of power connectors. Two new basic designs, the "P Series" and the "JJ Series" are now available for heavy duty connector or bus applications.

Fargo "P Series" combines several unique design features for increased range and conductivity. The sliding, two piece wedge shaped pressure pad provides complete en-



circlement and the parabolic serrated grooves are designed for both cable and I.P.S. tubing.

The wedge design of the "JJ Series" provides ease of installation and wide range of conductor sizes per unit. Serrated contours of the grooves completely encircle the conductors. The "JJ Series" like the "P Series" does not require disassembly for insertion of the conductor or bus.

Each of these new designs are available for terminal or reducer connections, and straightline, 90°, single or multiple taps.

Write U-621 on reply card, pg. 17

Transformer disconnects

New disconnects are another outstanding feature of the 1960 pole-type transformers by Kuhlman Electric Co., Birmingham, Mich.

Removal of the transformer cover

*Trademark

Fine Fanner Superformed Products

"Superforms* handle well" ...say CONSTRUCTION and MAINTENANCE ENGINEERS

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ARMOR RODS... Protect long-span T&D lines at supports

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FANNSPLICES... Join two ends of conductor wire

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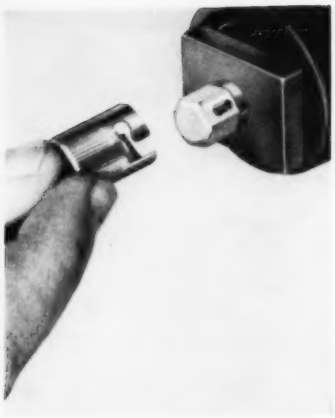


is simplified. The easily-reached disconnect at the base of the bushing releases the high voltage lead. Bushing-mounted protective link fuses are changed by the same easy method.

Sidewall bushing fuses may be replaced with equal ease and speed, right on the pole. No tools are necessary to replace a blown fuse in Kuhlman transformers with the new disconnects.

The disconnects are bayonet-type, seated by a slight turn to the right. A turn to the left releases the device. Positive contact is assured by spring loading the contact surface. The lock pins on the male element of the connector are guided into place by channels on the joining cup.

Write U-622 on reply card, pg. 17

Maximum current indicator

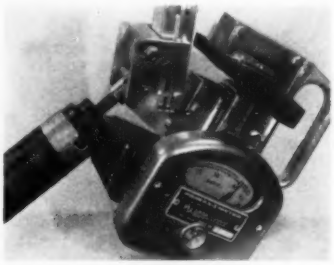
A new, easier to install, Primax-I-Meter to record maximum amperes on primary circuits has been designed by HD Electric Co., Deerfield, Ill.

Exclusive features include a one "shot-gun" grip-all hot stick, a scale range of 0 to 45 amperes, accuracy based on 2 per cent plus or minus at full scale, and a weight of less than 10 lbs. The instrument, which can be installed quickly by just one man, records maximum amperages on primary voltages in 15 minutes.

The HD Primax-I-Meter also features an optional 6 inch neoprene rubber insulator permanently installed in the transformer core opening. This makes possible immediate installation on bare conductor. Because of the "V'd" center of the insulator, the unit is prevented from shifting or drifting as a result of vibrations or high winds.

The HD Primax-I-Meter fits all makes of "shot-gun" hot sticks.

Write U-623 on reply card, pg. 17

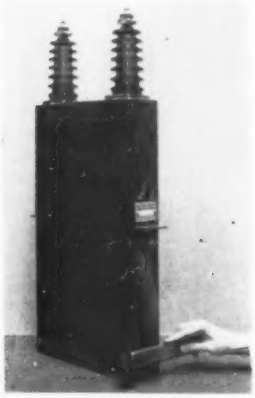


G-E 50-kvar capacitor

ONE OF THE lightest, smallest 50-kilovar capacitors ever available to the market, the "Compact Isokraft 50" unit, is now in production at the General Electric Company's capacitor plant in Hudson Falls, N. Y.

The new 82-pound unit is 17 pounds lighter and 20% smaller than the "Isokraft 50" capacitor introduced in July of 1959. Weight and volume savings were achieved without reducing the capacitor's effective cooling area, as its height and width dimensions are identical to those of the "Isokraft 50" unit.

The new units is nearly 40% lighter than a great number of 50-kvar capacitors which are presently installed and weighs approximately



the same as many 25-kvar units now in use. Because the distance between the mounting holes is NEMA standard 15 ⅝ inches, the new compact units are suitable for installation in any NEMA standard capacitor hangers or racks.

The smaller, lighter capacitor is the result of a continuing research and development program which has further improved the Isokraft paper dielectric introduced by G-E in 1959. The program has produced refinements in quality control and manufacturing techniques which permit greater utilization of the lower, flatter watts loss characteristic and high dielectric strength of the paper thus helping to assure lower operating temperatures and longer life.

Write U-624 on reply card, pg. 17

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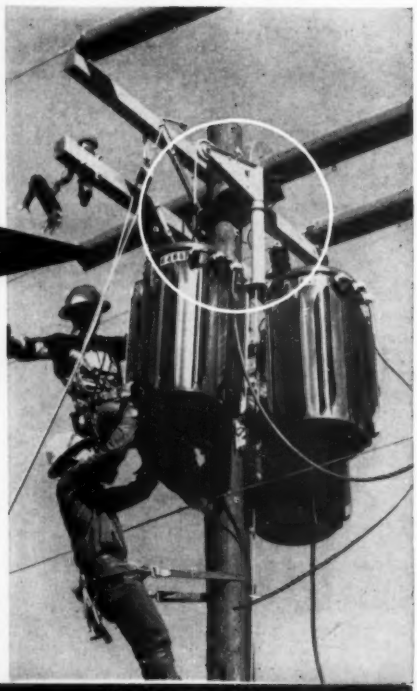
Transformer Hoist

- One position base mounting
- Swivel head permits multiple mounting
- Lightweight 2 piece portable unit (42 lbs.)
- Assembles easily at top of pole
- Tested at 3000 lbs. lift on cable
- Uses steel cable or manila rope

Save time with the MoPeCo hoist. You can install 3 transformers in only 30 minutes!



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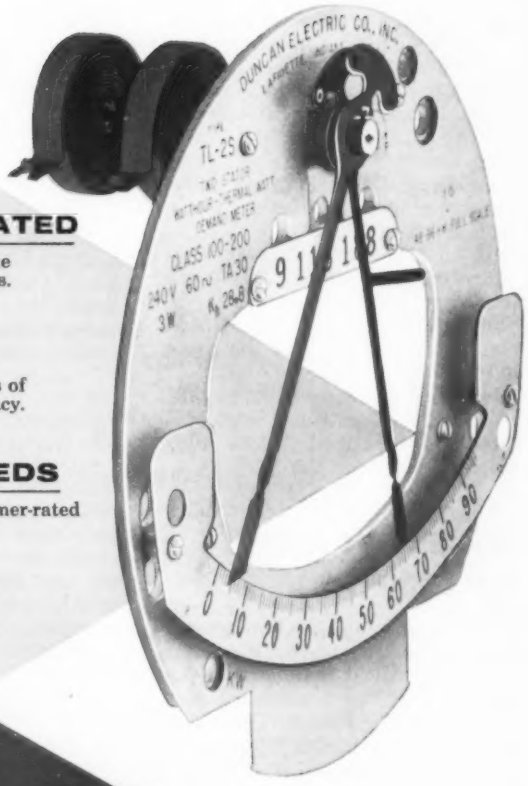


D **OES IT LOGICALLY**

The Duncan Thermal Demand Meter follows the same general heat-time curve that determines system capacity.

U **NNECESSARY PARTS ELIMINATED**

Long, reliable service is assured by a design using one moving part — moving only when the load changes.

N **O CALIBRATION PROBLEM**

Only one adjustment for up-scale point. Adjustments of the watthour meter do not affect the thermal accuracy.

C **APACITY TO MEET YOUR NEEDS**

Available in a full line of self-contained and transformer-rated meters. Maximum range to 200 amperes.

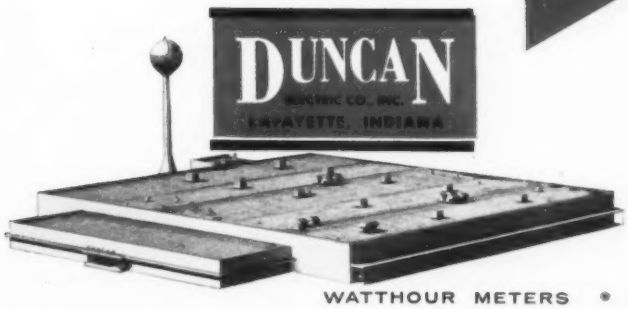
A **CCURACY MATCHES LOAD**

The Thermal Demand Meter does not split peaks. It measures actual demand.

N **O LARGE INVENTORY**

Dual range scale combinations available to cover most rate structures with a minimum of meters.

THERMAL METERS



"Thinking Ahead ... Moving Ahead ... to stay Ahead of Demand"

WATTHOUR METERS • MOUNTING DEVICES • DEMAND METERS

Know the law

by Arthur L. H. Street

Subcontract not proved with oral acceptance

◆ TO RELY upon an oral acceptance of a bid is to run the risk of a lawsuit that is apt to be lost. That is the object lesson to be learned from a case decided by the Washington Supreme Court. (Gattavara v. Scheumann, 315 Pac. 2d 649.)

Plaintiffs sued defendants, claiming that the latter as prime contractor on a job had orally accepted plaintiffs' bid on a subcontract for electrical installations, but discharged them after some work had been performed.

The Supreme Court said that plaintiffs failed to prove that their bid had been accepted, but that they were entitled to collect the reasonable value of the work and materials furnished before they were ousted from the job.

Subcontractor loses sum contractor withheld

◆ AN ELECTRICAL subcontractor sued a prime contractor to collect a sum claimed to be due under the subcontract. The Louisiana Court of Appeal, First Circuit, decided that because the specifications of contract made it clear that electrical subcontractor was to perform a completed job "including tying utilities all into existing services" and the job was to be "ready for immediate use," and work in connecting telephone outlets shown in plans to an existing telephone panel by conduit was obviously necessary to complete the job, subcontractor was not entitled to recover amount withheld by contractor in payment of another electrical contractor to complete installation of conduit for such telephone outlets. (Switzer v. Bozeman, 106 So. 2d 762.)

Responsibility for fire caused by short circuit

THE PROBLEM: Plaintiffs' house was almost completed and was partly furnished when destroyed by a fire that was caused by a short-circuit of electric wiring where it passed through a wall. Suit was brought against the electric power company and the contractor who installed the wiring, but was dismissed as to the contractor. Did plaintiff prove that the electric power company was responsible for the loss?

COURT'S ANSWER: No. So decided the Missouri Supreme Court in the case of Reicholdt v. Union Electric Co., 329 S. W. 2d 634.

Here were the principal facts: Defendant power company maintained a 4,160 volt distribution line along a nearby road. In order to furnish service to the plaintiffs, it had installed a transformer on a nearby pole which lowered the voltage for customer use from 4,160 volts to 120 and 240 volts. The transformer contained two 10-ampere fuses on the high voltage side.

In preparation for receiving service plaintiffs had installed a service pole near the west wall of their (attached) garage. In furnishing service to plaintiffs, defendant ran service lines from the transformer to the top of the service pole where defendant's lines were connected with wires that an electrical contractor had installed for plaintiffs.

From the point of that connection plaintiffs' wires ran down the pole, encased in a metal conduit, to a meter base which had been attached to the redwood siding which constituted the exterior garage wall. From the meter base the wires ran through the garage wall and connected with a circuit breaker installed on a section of wood paneling which had been affixed to the inside studding of the garage wall.

The distance from the meter base to the circuit breaker was approximately five inches. Between those two points the wires were encased in a 1½-inch thin-walled metal conduit. It was within this five-inch length of conduit that the short circuit occurred which caused plaintiffs house to be destroyed.

Transformer damaged too

After the fire it was found that two of the wires leading from the transformer were burned off flush "with the transformer secondary bushing." According to defendant that fact indicated that a high current was being drawn from the transformer. The transformer fuses had not blown. The damage to the transformer was such that it was replaced and thereafter "scrapped."

Utility exonerated

On the basis of these facts and other evidence tending to exonerate the power company, the Supreme Court concluded:

"Of course, under the evidence in this case, defendant could have afforded protection to plaintiffs' wires (and property) by fusing its transformer with 5-ampere instead of 10-ampere fuses. However, the fact that it could have done so does not mean that it had a duty so to do.

"The use of 5-ampere fuses would have caused more frequent interruptions in the service to all customers served by the transformer. These outages could result from defects in the wiring of any such customer or from 'surges' of excess current which sometimes exist in defendant's lines as a result of various operational procedures.

"We are unable to see any logical reason for adopting a rule which will subject all customers to inferior service when each customer can obtain the same character of protection by locating his fuse box or circuit breaker in such a manner (outside the building) that it will afford protection for all of his wires and facilities."

The Court added:

"We have not overlooked the fact that Mr. Ross, (plaintiffs' electrical expert witness) was permitted to express the opinion that, because of the size of the fuses used by defendant in its transformer, the circuit serving the home of the plaintiffs was not reasonably safe. However, it is clear from his entire testimony that his reason for concluding that the circuit was not reasonably safe was that there was a failure to afford protection against damage that resulted from defects in the wires owned and controlled by plaintiffs.

"In other words, we think the plain meaning of the expert's testi-

(Continued on page 141)

how good should power cable be

...*for long term stability?*

It isn't enough to meet or barely surpass specifications—not when it is possible to build maximum performance into power cable—as Circle does. Take, for example, the IPCEA-NEMA 60 cycle water absorption test.

Circlesheath® Type RR Power Cable Performance

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Date of original immersion: September 1958 Date of last test: April 1960

CABLE DESCRIPTION: 15KV, UNGROUNDED, SHIELDED	CIRCLESHEATH® CHANGE SIC	PERFORMANCE STABILITY FACTOR
700,000CM	4.3%	.6%
300,000CM	3.9%	.5%
300,000CM	3.6%	.4%

IPCEA-NEMA Requirements: Change SIC 1 to 14 days: 5% max.—stability factor after 14 days: 1% max.

The manufacture of high-reliability power cable is no accident. It requires expert knowledge of compounding techniques, absolute quality control—and production men who not only care enough . . . but *know enough* to produce the very best.

Circle's school for production men means better products for wire and cable users. Here laboratory technicians lecture on such subjects as extruding techniques, optimum operating speeds, testing procedures, etc.

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Murray "MP" Circuit Breakers

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Install the breaker that's best all around—best for you, best for your customers, and *Guaranteed For Life!*

You'll like working with "MP" breakers. *Fully magnetic* and unaffected by heat, these breakers never need derating, carry full rated load, never trip unnecessarily, can be installed anywhere it's most convenient for you or your customers.

Secondly, your customers will appreciate knowing that the breakers you install are *Guaranteed For Life.* It shows you're using the best, helps you get the business.

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See your Murray wholesaler today for full information on this precedent-breaking promotion. Ask him also about the material he has available to help you sell builders and homeowners on Murray *Guaranteed For Life* "MP" circuit breakers. Or write Murray directly for complete details.

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A circuit breaker that's *Guaranteed For Life!* I'm interested. As soon as possible, send me complete information on everything.

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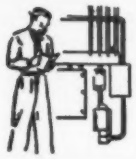

Understanding the Code

By Walter R. Stone

This article should be especially helpful to the following readers:

- Electrical Contractors
- Electric Utilities
- Electrical Wholesalers
- Electrical Inspectors
- Industrial Engineers
- Consulting Engineers

◆ THE QUESTION frequently arises as to whether equipment grounding conductors are required to be counted when determining the maximum number of conductors permitted in a box. Whether a bare conductor is to be counted in the same manner as an insulated (green) grounding conductor is also brought up frequently.

This question is very difficult to answer with any degree of definiteness. Some hedging is usually encountered.

The Code making authorities have stated in connection with this question that it is definitely the intent of Article 370 that equipment grounding conductors be counted as part of a box fill. These authorities have pointed out that the intent of the article is to provide sufficient free space for conductors and that anything using space is to be considered.

This is supported by Section 370-6 which states in the first paragraph, "Boxes shall be of sufficient size to provide free space for all conductors enclosed in the box."

Up to this point the answer seems to be definite, and it can be so taken. A literal reading of the Code indicates that it *must* be so taken. Many inspectors, following this literal interpretation, rule that all equipment grounding conductors are to be counted in the same manner as any other conductor.

Rule based on "averages"

Yet, there is considerable disagreement among inspectors in regard to this question. The reasons are many. Since the provision of adequate space is the primary objective, it is clear that the rules in Article 370 are based on an "average" of expected fill.

For instance, one No. 14 Type AVA conductor with a cross sectional area of .047 square inches requires more space than three No. 14 Type TW conductors of the same length. A No. 14 Type TW conductor has a cross sectional area of .0135 square inches. If that comes as a shock, I can say further that one No. 14 AVA requires more space than two No. 12 Type

Code test questions

1. In straight pulls with conductors of No. 6 or larger in raceways of 1¼ inches or larger, the length of a pull or junction box shall be not less than 8 times the trade diameter of the largest raceway. True or false?

2. Where angle or U pulls are made, the distance between raceway entries enclosing the same conductor shall be not less than 6 times the trade diameter of the larger raceway. True or false?

3. Provisions shall be made inside of non-metallic boxes for supports or other mounting means. True or false?

4. Time switches and flashers need not be of the externally operable type. True or false?

5. Double-throw knife switches shall be so connected that the blades are dead when the switch is in the open position. True or false?

6. A knife switch may be used as a general-use switch and opened under load

(a) where the current does not exceed 600 amperes at 600 volts or 1200 amperes at 250 volts.

(b) where the current does not exceed 1200 amperes at 600 volts.

(c) at its rated current and rated voltage.

Which is correct? a? b? or c?

7. For controlling inductive lighting loads on a-c circuits, a snap switch

(a) shall have an ampere rating twice that of the connected load or be of the T-rated type.

(b) shall have an ampere rating twice that of the connected load or be of the general-use a-c snap type.

(c) shall have an ampere rating twice that of the load to be controlled.

Which is correct? a? b? or c?

8. Auxiliary contacts of a renewable or quick-break type or the equivalent shall be provided

(a) on all 600-volt knife switches designed for use in breaking currents over 200 amperes and are recommended on all d-c switches rated at over 250 volts.

(b) on all d-c switches rated at over 250 volts.

(c) on all d-c switches.

Which is correct? a? b? or c?

9. A lighting and appliance branch circuit panelboard is one having

(a) more than 50 per cent of its overcurrent devices rated at 30 amperes or less.

(b) more than 50 per cent of its overcurrent devices rated at 20 amperes or less.

(c) more than 10 per cent of its overcurrent devices rated at 30 amperes or less.

Which is correct? a? b? or c?

10. Except at switches and circuit breakers, the distance between bare metal parts and bus bars in a panelboard shall be not less than

(a) 2 inches for 600 volts and 1½ inches for 250 volts.

(b) 1½ inches for 600 volts and 1 inch for 250 volts.

(c) 1 inch for 600 volts and ½ inch for 250 volts.

Which is correct? a? b? or c?

Correct answers may be found at end of articles on page 141.

TW conductors of the same length. Yet fewer No. 12 conductors are permitted in some type boxes than are permitted for No. 14 conductors without regard to types of insulation used.

As stated, this is for conductors of the same length. A No. 14 conductor 9 inches long would compare unfavorably with a No. 12 conductor 6 inches long. Section 300-14 requires a minimum length of 6 inches for such conductors, but there is no maximum requirement. (A maximum of 8 inches would not be unreasonable).

One wire must be deducted not for *each* cable clamp, but for "one or more fixture studs, cable clamps, or hickeys." A further reduction of one conductor is required not for *each* device, but for one or several flush devices mounted on the same strap. It might be noted here that the space occupied by one device is considerably greater than the space occupied by one No. 14 wire 6 inches in length. "Conductors of which no part leaves the box are not to be counted" at all.

It is clear, then, that the number of conductors permitted in various size boxes is based on an "average expected fill" and not on actual dimensions. Why, then, would each bare equipment grounding conductor be counted? One No. 14 TW conductor requires more space than ten No. 14 bare conductors of the same length, and one Type AVA No. 14 requires almost as much space as 14 bare No. 14 conductors of the same length.

Logical recommendation

It is not likely that 14 or even 10 bare equipment grounding conductors will be used in any one box such as those listed in Table 370-6(a-1). Therefore, why not deduct *one* conductor for *one or more* equipment grounding conductors? This is a reasonable deduction whether the equipment grounding conductors are bare or insulated, and this is exactly what many inspectors require.

A 3-inch switch box which shows 7 No. 12 conductors in the table would have one conductor deducted for the clamps, and one deducted for the device, leaving 5 permitted. If grounding conductors are used and one conductor is deducted for all equipment grounding conductors, then 4 circuit conductors would be permitted. This would allow one 2-conductor No. 12 with ground to go in and to go out of a 3-inch box.

Consult local authority

I repeat that this is a reasonable solution and one used by some inspectors. However, the local inspection authority should be consulted before proceeding on this basis. As stated earlier, above, many inspection authorities interpret Section 370-6 literally and require each conductor to be counted regardless of whether it is a bare equipment grounding conductor 6 inches long or whether it is 14 times that big and half again as long.

Alternate possibility

Where inspection authorities make no exceptions for the grounding conductors, such conductors can be joined and connected outside of the box since they are not current - carrying circuit conductors, provided that such boxes are in walls affording mechanical protection to the equipment grounding conductors. It is important when doing this not to bring the grounding conductor out of the cable covering ahead of the clamp.

The best grounding connection is obtained when the grounding conductor itself is effectively connected to both the box and to the grounding screw terminal in the device. The grounding connection then is not dependent upon a path through the yoke of the device. The screws fastening the yoke to the box are sometimes not screwed up all the way when the box is not quite flush with the wall finish. A direct connection of the device to the grounding conductor is much to be preferred.

Boxes and gutters

Table 373-6(a) lists the minimum width of gutters which may be provided for No. 1 or larger conductors entering or leaving a cabinet or cutout box. This minimum width is to assure sufficient room for deflecting the conductors without harmful pressure against the bushing. By a reference in Section 374-9(e) this Table 373-6(a) also lists the minimum width of auxiliary gutters when such gutters contain conductors deflected greater than 30 degrees.

All ungrounded conductors No. 4 or larger are required to be protected by an insulated bushing or the equivalent where such conductors enter raceways. Double locknuts are required by Section 373-6(b) when insulated bushings are used.

Section 373-8 is often in controversy. It states, "Switch enclosures shall not be used as junction boxes, troughs or raceways for conductors feeding through or tapping off to other switches, unless designs suitable for the purpose are employed to provide adequate space for this purpose."

Occasionally an electrician will run conductors through one switch or cabinet to get to another instead of running the raceway around the existing switch. This is never permissible. But whether one switch can be tapped to supply another depends upon the design of the switches, the space available, and the degree of crowding. It is usually best to use auxiliary gutters in such cases. However, the Code making authorities have indicated that it is not the intent of Section 373-8 to prohibit tapping one switch to supply another. Code inspection authorities must decide by field inspection after an installation has been made whether there is overcrowding and whether improper terminal connections have been made.

Where solderless terminal connectors are used which are so designed that more than one conductor can be properly terminated and where space is adequate, most inspection authorities will permit tapping without the supplementary use of auxiliary gutters. In many cases, however, terminal connections are not properly made and enclosures are loaded with a jungle of wires. These are usually rejected by inspectors and properly so.

As implied by Section 373-8, it is the inspector who must decide whether there is adequate space for the purpose. Unless there is a good reason for not using an auxiliary gutter such as for reason of its being in a hazardous Class I location, an auxiliary gutter is recommended. Where such gutters cannot be used, separate feeds to each switch usually can be run.

3-way switch violations

Section 380-2 is still violated occasionally either by switching the neutral or by running the neutral outside of the ferrous metal enclosure in which the "travelers" are contained. This section states, "Three-way and four-way switches shall be so wired that all switching is done only in the ungrounded circuit conductor. Wiring between switches and outlets shall, where in metal enclosures, be run with both polarities in the same enclosure."

The neutral is sometimes

switched by means of an incorrect connection instead of a Code grade connection. See Figure 1. This error is far less common now, however, than it was when knob-and-tube wiring was the usual wiring method.

The neutral is occasionally run outside of the enclosure when 2-wire armored cable is used as the travelers between two 3-way switches. Only 3-wire armored cable is permitted for such travelers. In a 3-way (or 4-way) switch, only one of the two travelers is used at one time as the hot conductor. The neutral is always the other conductor.

A connection which is frequently discussed and which does meet Code requirements, but which is believed by many to be incorrect, is the connection shown in Figure 2-a. This connection permits two 3-way switches to control a light in the house and a light in the garage. It also permits a receptacle outlet in the garage which is unswitched. This is done with 4 wires instead of the usual 5. It meets Code requirements provided the switches are rated to carry the load, because the neutral is not switched. Figure 2-b shows the connection using 5 wires.

Knife switch applications

Except for the double-throw type, all knife switches are required to be so connected that the blades are dead when the switch is in the open position. They are required to be mounted so that gravity would not tend to close them—that is, so that the switch closes when pushed up, not down. Occasionally, one is found connected so that the top clips are dead and the blades are hot when in the open position. This, of course, is incorrect.

Double-throw knife switches are required to be mounted so that the throw is horizontal unless they have locking devices to prevent accidental closing by gravity. Although it is not required by the Code, double-throw knife switches should be marked "Blades hot when open" or "Blades hot in all positions" or "at all times."

Knife switches can be used as isolating switches *only* for currents exceeding 1200 amperes at 250 volts and 600 amperes at 600 volts. Knife switches can be used for general use up to and including these ratings. For higher currents, either circuit breakers must be used or a switch of the pressure type or of other special design.

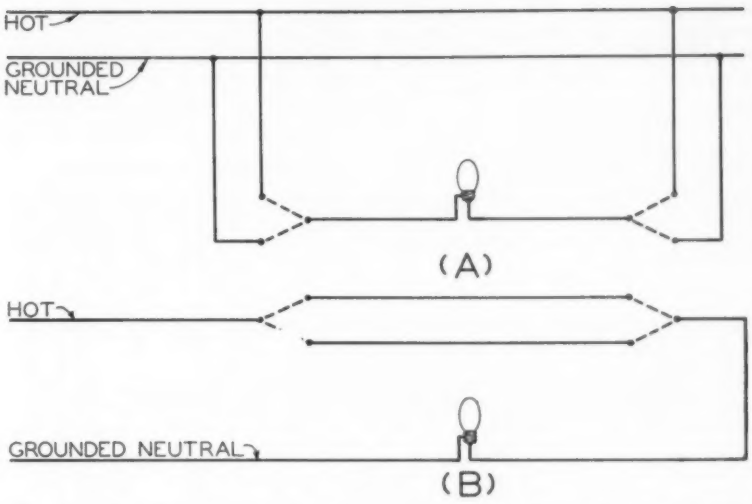

Fig. 1—The three-way switch connection shown in (A) above is not correct according to the Code because it results in the switching of the grounded neutral conductor. Correct wiring is shown in (B).

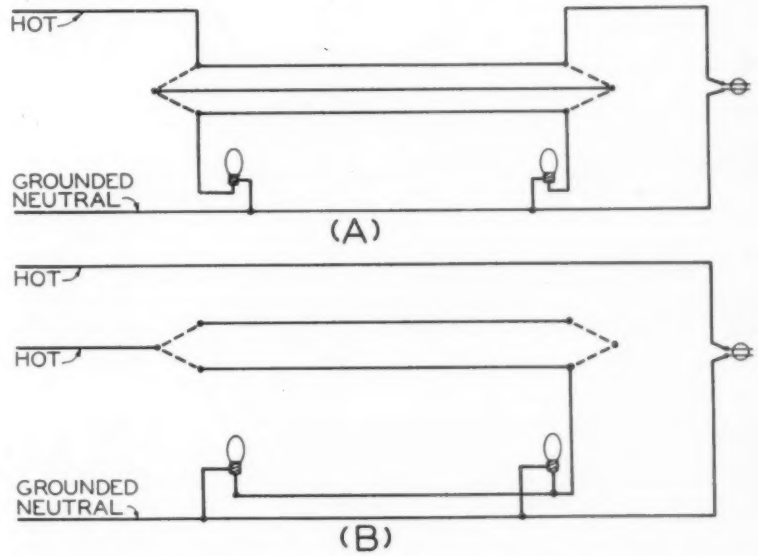

Fig. 2—The variation in wiring of three-way switches shown in (A) is not a violation of the Code. It permits operation from either the house or garage of lights located at both places and also provides a "hot" convenience outlet in the garage, with only four wires. Similar results can be obtained from the connection shown in (B) which may be easier to "dope out" but requires five wires.

Snap switch ratings

Confusion sometimes arises in regard to the use of snap switches. Some electricians believe that the "best" snap switch for any job is the T-rated switch. This is not true. The best switch for a-c inductive loads is the a-c general-use snap switch which is designed especially for a-c inductive loads, such as ballast-type lighting loads. Such switches may carry inductive loads up to, and including, the ampere rating of the switch.

Other snap switches must be rated at twice the ampere load connected to them where inductive loads are switched. For instance, an a-c general-use snap switch rated at 20 amperes could safely control a 20-ampere inductive

load, whereas either a general-use snap switch or a T-rated switch rated at 20 amperes could safely control only a 10-ampere inductive load.

T-rated switches are designed for tungsten-filament loads. They should be used for tungsten-filament or combination tungsten-filament and other non-inductive loads in public areas. For other than inductive loads then, the T-rated switch is best; and for such other loads, a switch which is not T-rated, must be rated at not less than 10 amperes, 125 volts or 5 amperes, 250 volts, except that 4-way types may have lesser ratings.

Switchboard problems

Section 384-3 requires conductors and bus bars to be properly supported and braced and to be so arranged that no metal partitions are interposed between the hot phases and the neutral. These precautions are necessary to prevent dangerous buckling in the event of heavy fault currents and to prevent heating from induction.

The minimum clearances required behind switchboards by Section 384-8 are believed by some inspectors to be inadequate. This section is followed by a fine print note which states "Some of the above dimensions are exceptions to Section 110-16." (Reference to Section 110-15 was probably intended.) The dimensions listed in Section 110-15 are not excessive or unreasonable and, where possible, should be maintained. The minimum clearances required by Section 384-8 should be increased where space permits. (The minimum clearances listed by Section 110-15 are required except where specifically permitted elsewhere such as behind switchboards by Section 384-8).

Selecting panelboards

Section 384-13 requires that panelboard sizes be determined in the same manner as feeder sizes. Section 384-16(c) states, "The overcurrent protective devices of all panelboards installed in industrial or commercial buildings where loads continue for long periods of time, shall have a rating not less than 125 per cent of the circuit loading, as determined by Articles 210 and 220."

In other words, if there is a load of 80 amperes, the panelboard selected must have a rating of not less than 125 per cent of 80, which is 100 amperes. Or if there is a panelboard rated at 100 amperes, the load which may be connected to it must not exceed 80 per cent of 100, which is 80 amperes.

(Some panelboards really should not be loaded to more than 70 per cent and some to not more than 66 per cent of their rated capacities when loads are to be on for long periods of time. Switches are checked and rated in the open air and without overcurrent devices in place. After having overcurrent devices installed and then being placed inside of enclosures they will overheat if loaded to the same extent as they were during the open-air, stripped down test.)

Section 384-16 states "... Panelboards equipped with snap switches rated at 30 amperes or less, shall have overcurrent protection not in excess of 200 amperes." A lighting and appliance branch

(Continued on page 141)

More about using EMT in concrete

THE ARTICLE that appeared in this section on pages 94-100 of the April issue, discussing the use of EMT in concrete, brought about a great deal of discussion. Because it appears that there may be some misunderstanding of certain parts of the article, and the subject in general, the editor would like to add the following comment as a supplement to the April article.

The key section of the Code dealing with these connectors and couplings is Section 358-8 which says, "Threadless couplings and connectors used with tubing shall be made up tight, and where buried in masonry, concrete, or fill, or where installed in wet places, shall be of a type to prevent water from entering the raceway." Now one of the things that complicates this situation is that Underwriters Laboratories lists two types; namely, "raintight" and "concretetight." While the concretetight is approved for use in concrete, it is not acceptable for "wet" locations, and this is what brings about some confusion because the local inspector is the man who interprets what is a wet location and what isn't. Here in Atlanta, for example, the inspection department considers a concrete slab on the ground as a wet location, and also an installation in an earth fill is considered a wet location. In such locations, they will not permit the EMT to be used at all. They do permit the EMT to be used in concrete floors above the ground and in masonry walls, etc., where there is not a wet location.

So far as we know, none of the indenter type connectors or couplings are listed as raintight (that is, suitable for wet locations). For such locations it would be necessary to use one of the compression type fittings listed as "raintight."

What confuses many electrical inspectors is the fact that the Code definitely says that where EMT is buried in concrete, the couplings must be "of a type to prevent water from entering the raceway." Now on the face of it, that would appear to require a fitting of the "raintight" variety (compression type). But apparently Underwriters Laboratories has recognized that some indenter type fittings are sufficiently watertight for use in concrete, and have listed these as "concretetight." Therefore, when no other water is to be encountered except the small amount in the concrete, these fittings should be, and we are sure are, adequate for the installation. On the other hand, when other moisture is to be present such as that in earth fills and in slabs directly on the ground, etc., the fittings must be such as the Code requires for wet locations, and that would call for a "raintight" fitting.

This confusion has led many inspectors not to permit EMT in concrete or earth fills at all. The purpose of our April article was to show that the Code does permit such EMT installations.

All through the article, mention is made only of "threadless fittings," which includes the whole range of EMT couplings and connectors. However, in the last paragraph, the author was not talking about concrete work in general, but was referring to EMT installations in concrete slabs on the ground and in earth fills. He points out that contrary to such beliefs as some inspectors hold, the Code *does* permit EMT in such locations.

Supplementing the last paragraph of the discussion on EMT installation in concrete slabs (April issue, page 100), we would like to point out that many indenter type EMT couplings and connectors are listed by the Underwriters Laboratories as concretetight. Such couplings and connectors which are listed as concretetight are considered by Underwriters Laboratories as safe to use with EMT in poured concrete if properly indented by the tools furnished by the manufacturer for the purpose.

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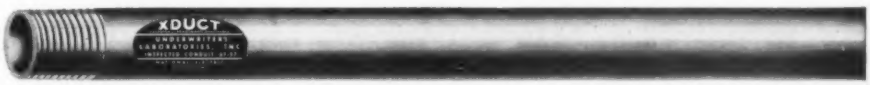

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New series of tables extended to include larger hourly rates

A NEW SERIES of estimating tables, completely revised in the light of more recent jobs and experience, are presented in this issue and will appear from month to month in forthcoming issues. These electrical estimating data sheets cover labor only and are arranged alphabetically with the basic material headings as a title for each tabulation.

Labor units given in these tabulations are based on a minimum of interference during work progress. The averages listed do not provide for abnormal job conditions, and any such abnormal conditions will require adjustments by the user, based on his experience.

The work units covered by each table are composed of one or more separate but closely related operations necessary for the complete installation of a particular basic item of electrical equipment. These operations associated with the basic material are described at the bottom of each table.

Most of the electrical estimating tabulations follow the same form. Column 1 at the left shows the size of the material to be installed. The second column from the left gives the time required to install the material, and it should be noted especially that this "productivity" column may be based on individual units or in the case of cable or conduit on units of 100 feet or 1,000 feet. The abbreviations "Ea." for each, "C" for hundreds, and "M" for thousands in Column 2 indicate the basis of the labor hours.

Columns 3 to 13, from the left, give the actual labor costs in dollars per unit of installation, at various hourly wage rates.

When calculations are being made for an hourly wage rate that doesn't correspond to any of the rates listed in Columns 3 to 13, the user may multiply the number of hours in Column 2 by 100 and this will give the labor cost based on an hourly wage rate of $1 per hour. By multiplying this by the hourly wage rate that actually applies in the user's locality, the exact labor cost of the operation may be obtained. Labor costs obtained in this way will be for units, hundreds of feet, etc., as given in heading of Column 2 of the table.

The labor units covered by the tables represent direct job labor costs and do not include delivery of material to site, engineering, estimating, or any other indirect cost.

As will be noted, some of the electrical estimating tabulations to be given will be for independent operations, such as excavating, backfilling, etc. These are included for use in preparing estimates on work of a special nature not covered under a specific table heading.

Tables will appear in alphabetical order.

UNDERGROUND CABLE (NON-METALIC)
THREE CONDUCTOR

OPEN TRENCH WORK

CABLE SIZE	HOURS "M"	LABOR COST INSTALLED PER FT. AT FOLLOWING RATES										
		$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75	$4.00	$4.25	$4.50
12	3.5	.007	.008	.009	.01	.011	.011	.012	.013	.014	.015	.016
10	5.5	.011	.012	.014	.015	.017	.018	.019	.021	.022	.023	.025
8	6.5	.013	.015	.016	.018	.02	.021	.023	.024	.026	.028	.029
6	9.1	.018	.021	.023	.025	.027	.03	.032	.034	.036	.039	.041
4	11.7	.023	.026	.029	.032	.035	.038	.041	.044	.047	.05	.053
2	16.6	.033	.037	.042	.046	.05	.054	.058	.062	.066	.071	.075
1	18.6	.037	.042	.047	.051	.056	.06	.065	.07	.074	.079	.084
1/0	21.6	.043	.049	.054	.059	.065	.07	.076	.081	.086	.092	.097
2/0	24.8	.05	.056	.062	.068	.074	.081	.087	.093	.099	.105	.112
3/0	28.1	.056	.063	.07	.077	.084	.091	.098	.105	.112	.119	.126
4/0	33.0	.066	.074	.083	.091	.099	.107	.116	.124	.132	.14	.149

E-102-B

LABOR: INCLUDES; SETTING UP REELS, LAYING CABLE AND CONNECTING AT ENDS.

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UNDERGROUND CABLE (NON-METALIC)
ONE CONDUCTOR

OPEN TRENCH WORK

CABLE SIZE	HOURS "M"	LABOR COST INSTALLED PER FT. AT FOLLOWING RATES										
		$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75	$4.00	$4.25	$4.50
12	2.4	.0048	.0054	.006	.0066	.0072	.0078	.0084	.009	.0096	.0102	.0108
10	3.8	.0076	.0086	.0095	.0105	.0114	.0124	.0143	.0152	.0162	.0171	.0181
8	4.4	.009	.01	.011	.012	.013	.014	.015	.017	.018	.019	.02
6	6.2	.012	.014	.016	.017	.019	.02	.022	.023	.025	.026	.028
4	7.6	.015	.017	.019	.021	.023	.025	.027	.029	.03	.032	.034
2	10.9	.022	.025	.027	.03	.033	.035	.038	.041	.044	.046	.049
1	11.9	.024	.027	.03	.033	.036	.039	.042	.045	.048	.051	.054
1/0	13.9	.028	.031	.035	.038	.042	.045	.049	.052	.056	.059	.063
2/0	15.8	.032	.036	.04	.043	.047	.051	.055	.059	.063	.067	.071
3/0	17.9	.036	.04	.045	.049	.054	.058	.063	.067	.072	.076	.081
4/0	20.8	.042	.047	.052	.057	.062	.068	.073	.078	.083	.088	.094
		TWO CONDUCTOR										
12	3.0	.006	.0068	.0075	.0083	.009	.0098	.0105	.0113	.012	.0128	.0135
10	4.7	.009	.011	.012	.013	.014	.015	.017	.018	.019	.02	.021
8	5.7	.011	.013	.014	.016	.017	.019	.02	.021	.023	.024	.026
6	8.0	.016	.018	.02	.022	.024	.026	.028	.03	.032	.034	.036
4	10.2	.02	.023	.026	.028	.031	.033	.036	.038	.041	.043	.046
2	14.5	.029	.033	.036	.04	.044	.047	.051	.054	.058	.062	.065
1	16.2	.032	.036	.041	.045	.049	.053	.057	.061	.065	.069	.073
1/0	18.9	.038	.043	.047	.052	.057	.061	.066	.071	.076	.08	.085
2/0	21.7	.043	.049	.054	.06	.065	.071	.076	.081	.087	.092	.098
3/0	24.5	.049	.055	.061	.067	.074	.08	.086	.092	.098	.104	.11
4/0	29.0	.058	.065	.073	.08	.087	.094	.102	.109	.116	.123	.131

E-102-B

LABOR: INCLUDES; SETTING UP REELS, LAYING CABLE, AND CONNECTING AT ENDS.

6-60

Electrical Estimating—III

UNDERGROUND CABLE (STEEL SHEATHED)
TWO CONDUCTOR

OPEN TRENCH WORK

CABLE SIZE	HOURS "M"	LABOR COST INSTALLED PER FT. AT FOLLOWING RATES										
		$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75	$4.00	$4.25	$4.50
12	4.6	.092	.104	.115	.127	.138	.15	.161	.173	.184	.196	.207
10	7.1	.142	.16	.178	.195	.213	.231	.249	.266	.284	.302	.32
8	8.3	.166	.187	.208	.228	.249	.27	.291	.311	.332	.353	.374
6	11.4	.023	.026	.029	.031	.034	.037	.04	.043	.046	.048	.051
4	14.8	.03	.033	.037	.041	.044	.048	.052	.056	.059	.063	.067
2	20.7	.041	.047	.052	.057	.062	.067	.072	.078	.083	.088	.093
1	22.9	.046	.052	.057	.063	.069	.074	.08	.086	.092	.097	.103
1/0	26.5	.053	.06	.066	.073	.08	.086	.093	.099	.106	.113	.119
2/0	30.1	.06	.068	.075	.083	.09	.098	.105	.113	.12	.128	.135
3/0	33.7	.067	.076	.084	.093	.101	.11	.118	.126	.135	.143	.152
4/0	39.4	.079	.089	.099	.108	.118	.128	.138	.148	.158	.167	.177
		THREE CONDUCTOR										
12	5.5	.011	.012	.014	.015	.017	.018	.019	.021	.022	.023	.025
10	8.7	.017	.02	.022	.024	.026	.028	.03	.033	.035	.037	.039
8	10.1	.02	.023	.025	.028	.03	.033	.035	.038	.04	.043	.045
6	14.2	.028	.032	.036	.039	.043	.046	.05	.053	.057	.06	.064
4	18.4	.037	.041	.046	.051	.055	.06	.064	.069	.074	.078	.083
2	25.8	.052	.058	.065	.071	.077	.084	.09	.097	.103	.11	.116
1	28.9	.058	.065	.072	.079	.087	.094	.101	.108	.116	.123	.13
1/0	33.8	.068	.076	.085	.093	.101	.11	.118	.127	.135	.144	.152
2/0	38.7	.077	.087	.097	.106	.116	.126	.135	.145	.155	.164	.174
3/0	43.7	.087	.098	.109	.12	.131	.142	.153	.164	.175	.186	.197
4/0	51.5	.103	.116	.129	.142	.155	.167	.18	.193	.206	.219	.232

E-102-B

LABOR: INCLUDES SETTING UP REELS, LAYING CABLE, AND CONNECTING AT ENDS.

6-60

Electrical Estimating—III

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News of the industry

edited for Southern readers

Electric heating up in commercial field

GEORGIA now leads the nation in the number of electrically heated commercial buildings, according to Georgia Power Company heating engineers, who report that the company is now providing electricity for heating 1,400 commercial buildings. New buildings containing all-electric heating installations are being added to the company's lines at an average rate of 55 a month.

The company's rates for its commercial customers have helped put Georgia at the top in electricially heated commercial establishments, according to J. E. Sweatte, who heads a corps of 42 electrical engineers specializing in adapting a variety of methods of electric heating for commercial purposes. Mr. Sweatte also pointed out that the increasingly downward trend of electric rates in Georgia has helped account for the state's leadership in the electric heating field.

"Additional credit," he said, "should go to great technological improvement in electric heating in recent years. The maximum capacity of heat pumps has multiplied 10 times in the past two years, making them capable of heating practically any size building."

Mr. Sweatte listed reasons for popular acceptance of electric heating as safety, cleanliness, economy, automatic operation, precise control of temperature, and the fact that there is no need for chimneys, vents and extensive floor space for equipment. Resistance heating elements have no moving parts and can outlast the building, he said.

Wood pole life subject of Florida conference

A THREE-DAY Southeastern Wood Pole Conference dealing specifically with the practical methods of detecting deterioration in wood poles, the selection of the best remedial treatment to prolong pole life, the making of sound economic choices between preserving in place, stubbing or replacing existing poles, and how to overcome the woodpecker problem, is being sponsored jointly by the University of Florida's School of Forestry and the General Extension Division of Florida.

Three other subjects are expected to be discussed briefly. These are the properties of wood, the preservative treatment, and the inspection of new poles.

The Southeastern Wood Pole Conference will be held August 23-25 at the University of Florida. Dr. Robert L. Fairing, conference coordinator, said that the speakers selected for the conference will represent private industry, utility companies, Rural Electrification Administration, U. S. Department of Agriculture, electric cooperative associations, and the School of Forestry at the University of Florida.

Exchange expands executive staff

ROBERT W. MCKINNON, of Roanoke, Va., will join the staff of the Southeastern Electric Exchange in Atlanta, Ga., as assistant director. The appointment will be effective July 1, 1960, according to an announcement by John W. Talley, executive director of the Exchange.

The Southeastern Electric Exchange is an organization of 26 privately-owned electric utility companies serving the southeastern portion of the United States.

The SEE staff is being enlarged, Mr. Talley said, because of the rapid growth of electric companies in this region and resulting expansion of the organization's services to the electric industry. SEE provides information and coordinates company activities in the fields of accounting, engineering and operation, accident prevention, real estate, personnel administration, power coordination, and sales.

R. W. McKinnon

Mr. McKinnon has been engaged in similar work since 1952 as executive secretary of the Public Utilities Association of the Virginias, an organization of electric and gas companies in Virginia and West Virginia.

A native of Charleston, W. Va., McKinnon attended Charleston schools and was a member of the staff of the Charleston Gazette from 1939 to 1942. In 1945 he became assistant director of the West Virginia Industrial and Publicity Commission, the state's industrial development and tourist promotion agency. He was appointed executive director of the Commission in 1948 and served in that post until 1952 when he became executive secretary to the Virginias utility organization.

Tampa distributor new NAED president

J. A. MEIER, of Florida Electric Supply, Inc., Tampa, Florida, was elected president of the National Association of Electrical Distributors. Mr. Meier succeeds George W. Provost, Jr., president, Doubleday-Hill Electric Co., Pittsburgh, Pa.

Announcement of Mr. Meier's election came at the final session of the 52nd Annual Convention held in the Dallas Memorial Auditorium, May 1 through May 4. Close to 3,000 persons from every section of the country attended the four-day meeting.

J. A. Meier

Mr. Meier previously had served as vice-president, Southern Region.

Three vice-presidents also were elected at the 52nd Annual Convention:

B. H. Boatner, president, Westinghouse Electric Supply Co., Pittsburgh, Pa., who was re-elected as vice-president, Eastern Region. Mr. Boatner was first elected to this post in May, 1959.

C. E. Butler, Jr., president, Butler Electric Co., Inc., St. Louis, Mo., who was re-elected as vice-president, Central Region. Mr. Butler was first elected to this post in May, 1959.

T. C. Treadway, Jr., president,

Treadway Electric Co., Inc., Little Rock, Ark., who was elected as vice-president, Southern Region, succeeding Mr. Meier.

Building costs increase slightly in six months

THE COST-TO-BUILD in eleven southeastern and south central states plus the District of Columbia increased one per cent in the six-month period ending April 1, according to Myron L. Matthews, manager-editor, the Dow Building Cost Calculator, an F. W. Dodge Corporation service.

This one per cent increase is an average figure based on data received from 29 cost-sampling cities. Twelve of these cities reported no change in the cost-to-build, while the remaining 17 reported increases of from one to 4 per cent. The average increase for the twelve-month period ending April 1 is 3 per cent.

The cumulative 19-year increase (from 1941) in the cost-to-build in these states is 153 per cent. This means that the house costing $7,500 for materials and labor in 1941 would cost $18,975 to build today.

Base wage rates for building workers have gone up from one to 4 per cent in the six months ending April 1 in 14 of the 29 cost-sampling cities, and remained unchanged in 15 cities. Building material prices for the same period remained unchanged in 16 of the cost-sampling cities, rose from one to 3 per cent in 12 cities and dropped one per cent in one city.

Building material prices in these southeastern and south central states average 110 per cent higher than they did in 1941. Wages in these 29 cost-sampling cities have increased 157 per cent since 1941.

Show dates announced by Electric Institute

THE THIRD Biennial Electrical Trade Conference and Exposition is scheduled to take place in Washington, D.C., February 14-16, 1961, according to an announcement made by William G. Hills, managing director of the Electrical Institute of Washington.

The three-day event will be under the joint sponsorship of the Electrical Institute of Washington and the Electrical Manufacturers Representatives Association of Baltimore. Paul O. West, president, Doubleday-Hill Co. of Washington, will be general chairman of the conference and exposition which will take place at the Sheraton Park Hotel. Space sales and management will be handled by the Electric Institute. Mr. Hill pointed out that the trade show will offer manufacturers an outstanding opportunity to show their latest equip-

Easy-to-use, fast, safe

JET LINE METHOD

works in any size conduit

SAVE $40.00 PER DAY ON WIRE-PULLING COSTS WITH THESE TOOLS:

Jet Line Power Cylinder — for 1/2", 3/4", 1" conduit
Jet Line Gun — for conduits 1 1/4" to 6"
Jet Line Poly Rope — lightweight, strong, flexible, non-conductor
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Proved on the job by contractors everywhere, the Jet Line Method* is by far the fastest means of wiring conduit ever invented.

Ask your wholesaler today for a demonstration . . . see for yourself how you can save time and money with Jet Line. Low-cost Starter Kits available.

*Pat. # 2,930,584

Ask your distributor for details, or write

JET LINE PRODUCTS, INC.

615 FUGATE AVENUE, CHARLOTTE 5, NORTH CAROLINA

ment, materials and services to a highly selective group of interested persons in the Washington-Baltimore and Richmond markets.

Exhibits will be limited primarily to industrial electronic equipments; controls, motors, motor drives; heavy panel boards; commercial and industrial lighting; electric space heating; safety devices and allied equipment.

Georgia AIEE completes effective program year

A POLICY during the past season of presenting programs of broad general interest within the field of electrical engineering has resulted in a successful year of activities for the Georgia Section of AIEE.

The final program of the season, held recently, featured special entertainment and installation of new officers. Installed as chairman for the coming year was D. C. Kyker, of General Electric Co., who succeeds J. L. Bodeker, of the Georgia Public Service Commission. Lex H. Curtis, of Westinghouse Electric Corp., was installed as vice-chairman.

One of the highlights of the program year was a joint meeting held recently with the Georgia Section of ASME, featuring John W. Simpson, vice-president and general manager of Westinghouse's Atomic Power Division, who addressed the joint meeting on the subject of "The Versatility of Atomic Power."

Mr. Simpson discussed the research and development that has produced the so-called high temperature alloys, and reported that the most promising civilian application of this technology is in magnetohydrodynamics, which, he explained, involves nothing more than the generation of an electromotive force by passing gasses through a magnetic field rather than using the solid core of a regular generator.

"A nuclear rocket uses a very high temperature atomic reactor at temperature in the range of 5000 degrees F—to heat gasses and produce thrust," Mr. Simpson said. "It just happens that this is about what we are seeking in MHD. Materials are the big limitation in each effort and a major materials effort in the refractory metals will have to succeed before either can reach their ultimate promise. But surely one program will serve the other."

ANDERSON ELECTRIC NEW HEADQUARTERS—President T. H. Fox (right) and J. H. Schuler, executive vice-president and general manager, are shown in front of Anderson's new administration building located at Leeds, Ala., some 30 minutes from downtown Birmingham. The completely air-conditioned facility has 13,000 square feet of space. In addition to executive officers, some 90 employees in sales, accounting, engineering and production have moved into the new quarters.

WEAVER TO DOUBLE PRODUCTION—Ground breaking ceremonies mark start of J. A. Weaver Company's new foundry in St. Louis which will permit the company to double present production capacity. Left to right, R. F. Monteen, manager of new plant, James E. Phelps, secretary, and William L. Gill, vice-president, all of Weaver Company; Austin E. Fitch, architect; R. E. Salveter and J. W. Graves, of Woermann Co.

Brief news notes of manufacturers

CONTRACTS have been let for a $500,000-plus addition to the South Bend, Ind., plant of the RACO Division of All-Steel Equipment, Inc., it was announced recently by Karl P. Grube, president of All-Steel.

According to K. C. Bolesky, vice-president of Roach Appleton Manufacturing Company (RACO) the newest expansion is necessary because of the recent acquisition of a Chicago conduit fittings firm. All production equipment was moved from Chicago to a newly acquired facility that was adjacent to RACO's plant in which switch and outlet boxes are manufactured.

The fittings facility is now in full operation and a complete line of fittings for rigid conduit, EMT (thinwall), armored cable, flexible metallic tubing, nonmetallic cable and service entrances, as well as accessory products are being manufactured.

* * *

A RECORD NUMBER of electrical distributors received the Thomas Industries Sales Achievement Award during the National Association of Electrical Distributors convention held recently in Dallas. A total of 115 distributors were honored for achievement in lighting fixture sales in 1959.

The awards were made by the Moe Light and Benjamin divisions of Thomas Industries, Inc., Louisville, Ky. John G. Beam, executive vice-president of Thomas Industries, and E. Allen Lea and Art Swedenborg, sales managers of the Moe Light and Benjamin divisions, respectively, presented the plaques at the firm's Sales Achievement Awards Breakfast.

* * *

LINE MATERIAL Industries, of Milwaukee, Wis., has announced a distributor agreement with Hughes Brothers, Inc., of Seward, Neb., which makes Line Material Industries the sole distributor of all Hughes Catalog items, effective immediately. The Hughes company line includes a wide range of products for transmission and distribution line and substation applications.

* * *

ELECTRO LIGHTING CORP., Chicago, Ill., has added 50,000 additional square feet to their manufacturing facilities at the Paulina street address. Increasing volume in the commercial and industrial lighting area has also led the company to add 24,000 square feet to their Reading, Pa., factory and to open a new 25,000-square-foot facility in Dallas, Texas.

The company is providing all of the lighting for the Chicago Exposition Center on Chicago's lakefront scheduled to open in autumn, 1960.

* * *

PLANS OF two St. Louis manufacturing companies, Emerson Electric Manufacturing Company and Day-Brite Lighting, Inc., to join forces have been given preliminary approval by their respective boards of directors, it has been announced.

The joint announcement was made by W. R. Persons, president of Emerson Electric, and O. W. Klingsick,

Announcing **2 New Industrial Products from EDWARDS**

entrance register

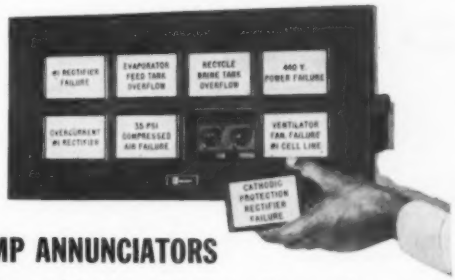
switchboard push button panel

Edwards new In-dicator system keeps track of key personnel. Telephone operators or receptionists can tell who's in at a glance, without wasting time or using noisy voice paging systems. Ideal for offices, plants, schools and institutions.

1 PERSONNEL IN-DICATOR

- When flipped by key personnel, toggle switches on entrance register automatically carry "in-or-out" data to switchboard panel.
- operator presses button adjacent to individual's name—lamps indicate "in-or-out".
- individual executive desk switches can be substituted for switch on entrance register panel.
- both systems install easily and quickly.

From Edwards long experience in annunciator systems comes this completely new line of lamp annunciators...developed in cooperation with leading utilities, chemical process and industrial plants. Here are some outstanding features:



2 INDUSTRIAL LAMP ANNUNCIATORS

- flexibility of indications—modular "plug-in" construction permits simple establishment or change (from the front) of operational sequences without altering terminals, connectors, or jumpers.
- wide selection of operational sequences to cover all requirements.
- indicating circuit provides extra contacts and terminals for data logging or other control functions.

EDWARDS

THE EDWARDS SELLING TEAM

Selected electrical distributors across the country stock and sell Edwards products. Recognized electrical contractors install them. Edwards technical representatives in 58 cities throughout the United States and Canada work with them from initial planning through installation and follow-up, to guarantee complete satisfaction.

Edwards Company, Inc.
Norwalk, Connecticut

Please tell me more about the following products:

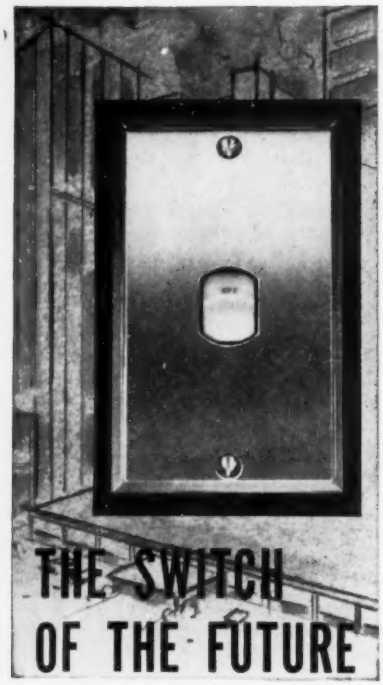
☐ the new Personnel In-dicator. ☐ the new Lamp Annunciators.
☐ both the In-dicator system and the Lamp Annunciators.

Name_____

Title_____

Company Name_____

Address_____



is being used NOW! . . .

P&S ROCKER-GLO SWITCH

Many of today's switches are specialties primarily designed for appeal in decoration. Others are designed to meet the rugged use and performance called for by a heavy duty switch.
Now, one new switch, Rocker-Glo, combines eye-appealing design with heavy duty performance. So impressed with this combination are architects, engineers and contractors that Rocker-Glo is already being specified in leading hotels, motels, hospitals, commercial buildings and housing developments. Rocker-Glo has high-grade silver alloy contacts. Its modern design and unique construction allow this switch to be pressed, pushed, rocked or rolled into instantaneous action.
Rocker-Glo switches are designed to be used at full current rating on tungsten filament and fluorescent loads. Available in Despard interchangeable type, Despard type mounted on a strap and narrow rocker for tumbler switch plates. A specification grade switch, 15 and 20 amps. 120/277 volts AC.

P&S *Write for free Rocker-Glo bulletin — Dept. ES-66*

PASS & SEYMOUR, INC.
SYRACUSE 9, NEW YORK

49 E. 42nd St., New York 17, N.Y. • 1440 N. Pulaski Rd., Chicago 51, Ill. • In Canada: Renfrew Electric Co., Ltd. Toronto, Ontario

president of Day-Brite. Final plans will be submitted to both boards for approval within two weeks. The Day Brite board action will be submitted to the stockholders for their approval, but board action alone is sufficient in Emerson's case.

Under the agreement, both companies will retain their present identity, management, personnel, products and plants. Day-Brite will become a subsidiary of Emerson.

News about people

John R. Horton, general superintendent of power for Louisiana Power & Light Company, passed away recently in New Orleans at the age of 63. A Navy veteran of World War I, Mr. Horton had been associated with the electric power industry 41 years. He began his career with Arkansas Power & Light Company, in Pine Bluff, in 1919. He joined Louisiana Power & Light Company in 1925. When the company began construction of the Little Gypsy station in late 1958, Mr. Horton was named superintendent, and later was made general superintendent of power for LP&L.

Roy E. Wilson Company, Atlanta, has been appointed manufacturers representative in Georgia for S&C Electric Co., according to **John R. Conrad,** president. The Roy E. Wilson Company and its predecessor has been engaged in sales of electric power equipment, controls and switches for 27 years.

Robert A. Olson has been named president of Kansas City Power & Light Co., succeeding **Harry B. Munsell,** who becomes chairman of the board.

Mr. Olson has been with K. C. P

Dates ahead

Southeastern Woodpole Conference, University of Florida, Gainesville, Fla., Aug. 23-25, 1960.

National Rural Electric Cooperative Assn., Region I, Annual Meeting, Commander Hotel, Ocean City, Md., Sept. 8-9, 1960.

Illuminating Engineering Society, National Technical Conference, Penn-Sheraton Hotel, Pittsburgh, Pa., Sept. 11-16 1960.

National Rural Electric Cooperative Assn., Region VIII, Annual Meeting, Motel Arlington, Hot Springs, Ark., Sept. 12-13, 1960.

National Rural Electric Cooperative Assn., Region II, Annual Meeting, Kentucky Hotel, Louisville, Ky., Sept. 15-16, 1960.

Public Utilities Association of the Virginias, 42nd Annual Meeting, The Greenbrier, White Sulphur Springs, W. V., Sept. 15-17, 1960.

Southeastern Electric Exchange, Accounting Conference, Tides Hotel, St. Petersburg, Fla., Sept. 29-30, 1960.

American Institute of Electrical Engineers, Fall General Meeting, Chicago, Ill., Oct. 9-14, 1960.

National Rural Electric Cooperative Assn., Region II, Annual Meeting, Henry Grady Hotel, Atlanta, Ga., Oct. 10-11, 1960.

National Rural Electric Cooperative Assn., Region IV, Annual Meeting, Stonewall Jackson Hotel, Clarksburg, W. Va., Oct. 13-14, 1960.

National Rural Electric Cooperative Assn., Region X, Annual Meeting, Baker Hotel, Dallas, Texas, Oct. 17-18, 1960.

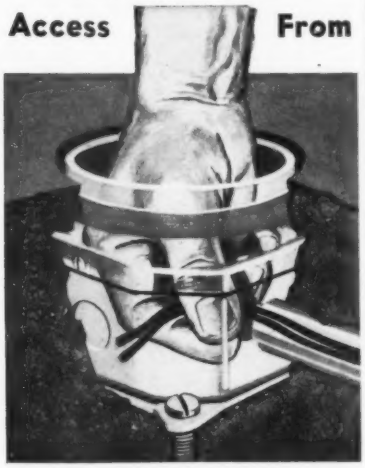
IAEI, Southern Section, Rice Hotel, Houston, Texas, Oct. 17-19, 1960.

Southeastern Electric Exchange, Engineering and Operation Section Conference, Shoreham Hotel, Washington, D. C., Oct. 20-21, 1960.

Power Industry Computer Application, 2nd National Conference, Chase Hotel, St. Louis, Mo., Nov. 9-11, 1960.

Southeastern Electric Exchange, Sales Conference, Henry Grady Hotel, Atlanta, Ga., Nov. 16-18, 1960.

COMPLETE HAND Access From



TOP of CONCRETE To Bottom of BOX

This #190 "Tru-Level" series is a standard 4 inch octagon, sheet steel box, developed for concrete or tile floors, also wooden floors with concrete base.

A threaded brass adjusting-ring permitting 1/2 inch height adjustment, in addition to three screw legs 2 1/2 inches long, make for quick and easy tru-leveling.

Conduit attachment or wire-pulling is easy even when concrete is poured to very top of box. The 3 1/4 inch opening in the box-body permits whole hand access from top of concrete to bottom of floor box.

Designed to fit all popular size and style receptacles — simply clip off plaster ears and drop into place.

Listed under re-examination services of Underwriters Laboratories, Inc.

Represented in the South by

CARY CHAPMAN & COMPANY
702 Whitehall St., S.W., Atlanta, Ga.
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& L for 13 years. During the previous 12 years he had served in various capacities with the United Light & Railways Co., in Chicago. Mr. Olson was named secretary-treasurer of the company in 1949, became a vice-president in 1955, and has been a director of the company for 10 years.

General Electric Company's Insulator Department has announced the establishment of a new 30-state sales zone, with headquarters in Atlanta, and the appointment of **H. M. Carmichael** as zone sales manager. Mr. Carmichael will be responsible for coordinating sales of G-E insulator products through district offices in

H. M. Carmichael

Atlanta, Baltimore, Boston, Birmingham, Charlotte, Chicago, New York, Pittsburgh and St. Louis.

A native of Jackson, Miss., he joined Locke Insulator Corp., of Baltimore, a G-E affiliate, as a sales engineer in 1946. In 1951, he was transferred to Atlanta as Southeast regional manager for Locke.

Harry L. Gilham, Jr., has announced the opening of the Georgia Lighting Supply Co., Inc. with showrooms and offices at 835 Spring Street, N. W., Atlanta., which will serve as wholesale distributors of lighting fixtures, lamps, home music

H. L. Gilham, Jr.

LIGHTING PRICES

You asked for it Now it is ready

A Brand New

COMPLETELY ILLUSTRATED

NATIONAL PRICE SERVICE

LIGHTING PRICE BOOK

for

Industrial and commercial fluorescent fixtures, incandescent fixtures, floodlighting, associated equipment

HENDERSON-HAZEL CORP. Dept. G-06
13601 EUCLID AVENUE • CLEVELAND 12, OHIO

Gentlemen:

Please send me complete details about the new NPS "Lighting" price book without obligation.

Name _____

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Company _____

Address _____

City _____ Zone ____ State _____

NPS National Price Service
HENDERSON-HAZEL CORP.

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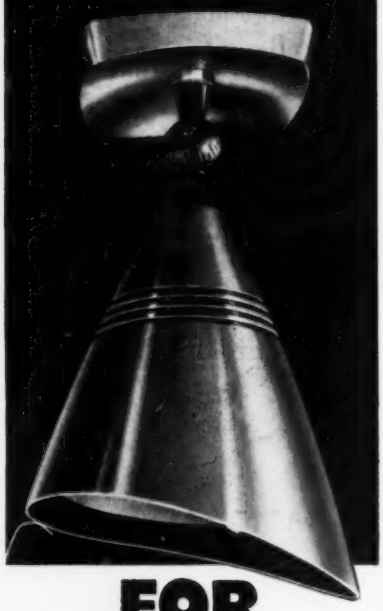
NEW BULLET BEAUTY



FOR OUTDOOR DUTY!

Don't let the styling of STONCO's new "Award Series" fool you. These are **outdoor** bullets. Solid cast aluminum. Completely weatherproof. "Air-conditioned" for cooler, cleaner operation. The only truly decorative floodlights designed specifically for any outdoor application.

A COMPLETE LINE FOR 75W-300W REFLECTOR LAMPS Single or cluster fixtures in 3 distinctive styles, wide range of finishes. For ceilings, walls, under eaves . . . all exteriors requiring a high degree of architectural and color fidelity.

- The Award Series is now on display at your STONCO distributor. Look for it.
- Write today for Award Series catalog: Section A-78.
- See Sweet's Architectural file: 33a/ST.

STONCO *Award Series*

CLUSTER LIGHTS • POWER BEAMS
VAPORTIGHT • BOXES AND FITTINGS
EMERGENCY PORTABLES

©STONCO ELECTRIC PRODUCTS CO.
KENILWORTH, NEW JERSEY

systems and inter-coms, kitchen and bath ventilating and heating products. Mr. Gilham, a native of Atlanta and honor graduate of Emory University is president and sales manager of the new firm; **Mrs. Nell Collins,** a board member of the Atlanta Electric League is showroom manager and lighting consultant.

Nathan A. Toalson has been elected president of the A. B. Chance Co. He will succeed **F. Gano Chance,** who will continue as senior officer, chairman of the board, and chairman of the executive committee. Mr. Toalson has been executive vice-president

N. A. Toalson

of the power and communication equipment manufacturing firm since 1956.

Mr. Chance also announced the appointment of **L. C. Hansen** as vice-president and general manager of the Chance Division, largest of the

L. C. Hansen

company's three major divisions. Hansen will direct marketing, manufacturing and engineering functions of the company's Centralia, Mo., Pittsburgh, San Francisco and Parkersburg, W. Va. operations. Hansen has been vice-president of marketing since 1955.

Victor Christian, Jr., has been named a sales representative in Georgia for Ramset Fastening System, part of the Winchester-Western Division, Olin Mathieson Chemical Corp., it was announced by **R. H. Benedict, Jr.,** sales manager.

Mr. Ramset, with headquarters in New Haven, Conn., produces powder-actuated fastening tools, Shure-Drive hammers, Shure-Set hammer-in fastening tools and assorted fasteners for split-second fastening into steel and concrete.

Simplex Wire & Cable Co., Cambridge, Mass., has announced the appointment of **Marshall A. Williams** as director of marketing. Mr. Williams, who will direct the activities of the newly created Marketing Department, has been active in the electronic and electro-mechanical fields for the past 25 years.

B. Allen Bryant, Atlanta, Ga., has been named by Arvin Industries, Inc., Columbus, Ind., as district sales manager for the firm's primary electric heat division. In his new position, Mr. Bryant will be in charge of primary electrical heating system sales for Arvin in western North Carolina, Tennessee, Missis-

B. Allen Bryant

sippi, Alabama, Georgia and the New Orleans area. He was formerly an electrical construction material manufacturer's representative for the last 20 years, working with contractors and distributors in his present territory much of that time.

The newly formed firm, **John L. Marsh & Associates,** 1641 Landon Ave., Jacksonville, Fla., has recently been appointed as manufacturers' representative for Tele-Wire Supply Co., Jamaica, N. Y., and Walter G. Pearson Co., Charlotte, N. C. The territory includes the states of Florida, Alabama and Georgia. The company had previously been appointed representative for Ansonia Wire & Cable and Hendrix Wire & Cable.

Mr. Marsh organized the firm of John L. Marsh & Associates in March of this year. Until that time, he was a vice-president in charge of sales for Ansonia Wire & Cable Co.

The Electromode Division of Commercial Controls Corp., Rochester, New York, manufacturer of electrical space heating equipment recently announced the promotion of **Philip L. Kamerer** to sales representative. Mr. Kamerer will coordinate the sales

P. L. Kamerer

and engineering needs of Georgia, Alabama and Northern Florida, from his offices in Atlanta, Ga.

Mr. Kamerer joined Electromode in 1955 as a design engineer and became a member of the sales headquarters staff in 1957. His appointment to Atlanta was announced by **P. D. Hawkins**, general sales manager.

Columbia Cable & Electric Corporation has appointed **Arthur H. Swartz** its sales representative for the South Texas area, and he has opened a new 8000-square-foot Houston warehouse, at 2120 Polk Ave. He will carry a complete stock of Columbia products and also items produced by Shalda Manufacturing Co., Inc., Elliott Electric Products Co., and Fullman Manufacturing Co.

After attending University of Houston, Mr. Swartz began his electrical career with General Electric Supply Company's Houston branch in 1948, and later was manager of Marlin Associates' Electric Supply Department. He was a salesman for Houston's Wholesale Electric Supply, and represented Worth Electric Supply for six years prior to entering the agency business in 1958.

A. H. Swartz

Lawrence G. Maechtlen has been elected president of the Square D Co., one of the country's leading manufacturers of distribution and control equipment. Mr. Maechtlen, who is 56, has been associated with Square D for 34 years, joining the company upon his graduation from California Institute of Technology in 1926 with a degree in mechanical engineering.

In 1951, he was elected a vice president and director while con-

L. G. Maechtlen

tinuing to head the western operations. He was transferred to corporate offices in Detroit as first vice-president in 1957, and was named to the newly-created post of executive vice-president in October, 1958.

William R. Smart has been appointed marketing manager of General Electric's Distribution Transformer Department in Pittsfield, Mass., according to an announcement by **Harland P. Sisk**, department general manager. Mr. Smart succeeds James L. Elrod, who becomes manu-

Wm. R. Smart

facturing programming manager in the department.

A graduate of Princeton University, Mr. Smart joined General Electric in 1941 as a student engineer. After holding a variety of engineering assignments, he became consultant—sales and distribution in marketing services at the Company's headquarters in New York.

PRECISION

ELECTRIC HOT WATER HEATING BOILER

COMPLETE UNIT READY FOR INSTALLATION with circulating hot water system and water chiller for year-round air-conditioning

CONVERSION EASILY ACCOMPLISHED where other type fuels now used. Suited for homes, churches, motels, apartments, hotels, hospitals, commercial buildings, swimming pools, snow melting and domestic hot water. Temperature Range 60 to 250 degrees.

Every unit tested and inspected.

- 40,948 B.T.U. to 2,000,000 B.T.U. Output.
- All Boilers meet the requirements of the ASME Boiler and Pressure Vessel Code.

No flame!
No ducts!
No noise!
No chimney!
No odors!

Write for specifications and prices.

PRECISION parts corporation

400-ES NORTH FIRST STREET
NASHVILLE 7, TENNESSEE

Felix C. Karlson has been appointed eastern regional manager of Federal Pacific Electric Co., it was announced by **Harry E. Knudson, Jr.**, the company's director of sales. In his new position, Mr. Karlson will be responsible for sales activities of the electrical manufacturing firm in the

F. C. Karlson

greater New York area, Long Island, northern New Jersey, and part of Connecticut.

Previously, Mr. Karlson was merchandising sales manager of Federal Pacific. He joined the company in 1950 as a sales trainee, being promoted a year later to field engineer in Harrisburg, Pa., and in 1957, to Baltimore district manager.

Technical books

for the electrical man

Electricity from heat

"Direct Conversion of Heat to Electricity," by Joseph Kaye, professor of mechanical engineering, MIT and director of Research Laboratory of Heat Transfer in Electronics; and John A. Welsh, assistant professor of mechanical engineering, MIT. Published by John Wiley and Sons, Inc., 440 Park Ave. S., New York 16, N. Y., 377 pages, illustrated, $8.75.

A new development in the art of producing electricity has dawned. A box with no moving parts, which converts thermal energy directly into electrical energy has been devised.

Because the field is so new, however, no trained personnel exist, so engineering talent along this line is unavailable; and until now, no concentrated source of reference material existed to train such workers.

This volume is an edited collection of papers by the principal contributors of the new technique. Fundamental discussions in the thermocouple, the vacuum tube and the gaseous tube, separating the positive and negative charges in a gas, and the separation of positive and negative charges during a chemical reaction are studied in detail.

The papers were prepared in connection with a summer program on "Direct Conversion of Heat to Electricity," offered by the Department of Mechanical Engineering of the Massachusetts Institute of Technology in July, 1959.

Beginning electronics

"Electronics for the Beginner," by Jay Stanley. Published by Howard W. Sams & Co., Inc., 1720 East 38th St., Indianapolis 6, Ind., 192 pages, $3.95.

"Electronics for the Beginner" grew out of author Jay Stanley's experience in helping his teen-age son learn radio and electronics. Stanley, a frequent contributor to electronics magazines, concluded the only way his son could learn was by doing.

With this thought in mind, the author introduces the beginner to the fundamentals of constructing electronic devices. Each project is increasingly difficult, so the neophyte also picks up a liberal dose of electronic theory along the way.

Projects include: a "one-hour" radio; one-transistor headphone amplifier; speaker amplifier; pocket radios; home broadcaster; utility amplifier; converting to stereo; short-wave tuner; hi-fi enclosure; and several others. All equipment is completely transistorized—a unique feature in books of this kind.

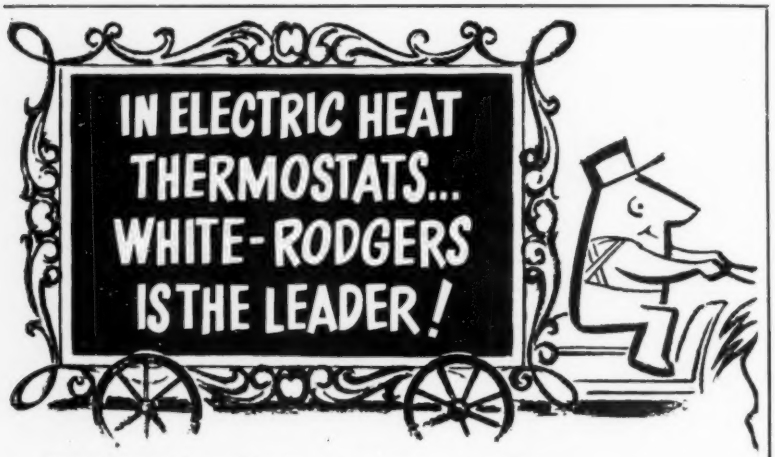
Other chapters in the book deal with tools and the gentle art of soldering, electronic parts and symbols, reading circuits, etc.

Fractional hp motors

"Basics of Fractional Horsepower Motors and Repair," by Gerald Schweitzer Published by John F. Rider Publisher, Inc., 116 W. 14th St., New York, N. Y., 168 pages, illustrated, $3.90.

A new book on fractional horsepower motors, which would be an invaluable reference to firms servicing major and small appliances, has been written by Gerald Schweitzer, training and service publications supervisor, Fedders Corp.

Chapters on all types of fractional horsepower motors used in appliances are included.



Use them with confidence—they're specifically designed for Electric Heat by White-Rodgers—world's largest maker.

Sold under the brand names of more than fifty manufacturers of quality electric heating equipment.

Type 1A61
World's Largest Seller

Type 1A65
Elegant New Companion

Write for full color folder R 1625

WHITE-RODGERS CO., ST. LOUIS 6, MISSOURI TORONTO 8, CANADA
ATLANTA 8, GEORGIA • 732 Spring St., N. W.

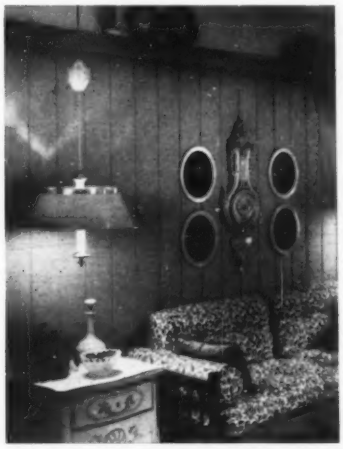
New products

Moe home lighting fixtures

The 1960 Moe line of lighting fixtures for the home include fixtures of two basic types: those intended for general room illumination, and the accent models designed to highlight special features and appointments.

Variety and adaptability keynote the 1960 Moe Light line, with some two dozen ceiling pulldown models offered in modern, contemporary, traditional or colonial stylings.

Pendants, too, are becoming increasingly popular, and Moe Light has them either in clusters of three



(in five stylings with cord, brass or opal glass shades) or in seven individual models. Three separate Moe Light Spreader Kits make possible groupings of identical or mixed levels and fixture types.

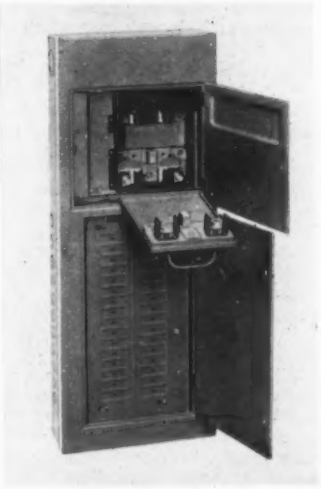
Thirty new decorated glass fixtures, intended for close-to-ceiling mounting and over-all room illumination, are also being presented. Available in a wide range of shapes, sizes, and stylings, these bent glass fixtures blend or contrast with any decorator motif.

Rounding out the 1960 Moe Light line, more than three dozen types of outdoor wall and ceiling lanterns, entryway accent bracket fixtures and doorway lights are offered, in addition to a complete line of single and double outdoor floor and spotlights.

Write P-625 on reply card, pg. 17

Non-interchangeable enclosure

On July 1, 1960, the new N. E. C. Code becomes mandatory for the use of non-interchangeable breakers. Wadsworth's new 200 ampere fusible main has provisions for 24-32 or 40 circuits. For over one year the "E-Z-Red" non-interchangeable breaker



has been in use and has proven acceptability throughout the country.

This new device was designed to control the following: electric heat, hot water, cooling, range, oven, washer, dryer, refrigerator, freezer, dishwasher, disposer, radio, besides the smaller appliances such as toasters, mixers, indoor and outdoor lighting, etc.

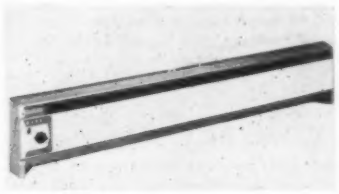
Wadsworth's new 200 ampere fusible main with provisions for breaker branch circuits will fit between studs set 16 inches on center. It is for 3-wire service, solid neutral, 120/240 volts a.c. The cabinet is available in either surface or flush mounting with deadfront construction also for indoor and raintight installations. It is listed by Underwriter's Laboratories.

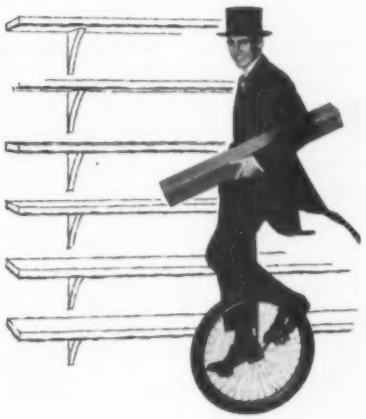
Write P-626 on reply card, pg. 17

Markel baseboard heater

The exclusive new Markel automatic portable baseboard Heetaire, produces gentle even heat at floor level for completely balanced room heating without drafts, or cold air pockets. And its built-in automatic thermostat is accurate within 2°.

Fitting snug to the baseboard, the cord set (which fits standard 120 volt outlet receptacles) becomes inconspicious in the room and permits





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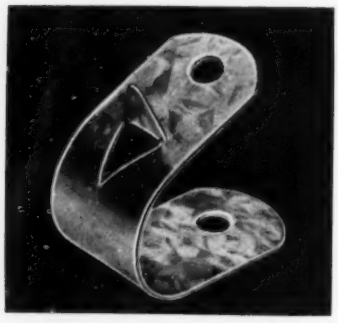
Write P-627 on reply card, pg. 17

Cable mounting strap

An armored cable mounting strap, called the "Spurit," is being manufactured by the Cable and Pipe Strap Co., Inc., of Hopkins, Minnesota. The manufacturer reports that the strap will greatly reduce cable installation time and costs.



In use, the Spurit is mounted by placing it over the armored cable and driving spur into the wall at the desired location. The strap is then attached permanently to the wall with an 8 penny nail. Although designed for use with armored cable and flexible electrical conduit, the strap can be used with other types.

Write P-628 on reply card, pg. 17

Cover marks outlets

AN ANNOYING PROBLEM of plasterers and electricians is solved with the introduction of a device which serves as both a protector and locator of electrical outlets for plastered walls.

Called Code Cover, it has just been brought out by Code Cover Co., represented by H. E. Kaufman, 566 N. Pine, Chicago, Ill. It is a metal plate which is snapped onto the outlet box before plastering, a protective tape is then peeled off the plate exposing a small tablet of dye set into a cavity in the plate. The plate fits flush with the box cover so that it offers no interference with plastering. The plasterer then covers the wall, including the plate, with no neeed to concern himself about working around the outlet or the screw holes which are also covered by the plate.

A small spot of color from the dye tablet bleeds through the plaster and spotlights the exact location of the outlet. When the plaster is dry, pressure is applied to the dye spot, and the Code Cover is then pushed in, removed and discarded. Holes are exposed with the plaster left clean and sharp all around it.

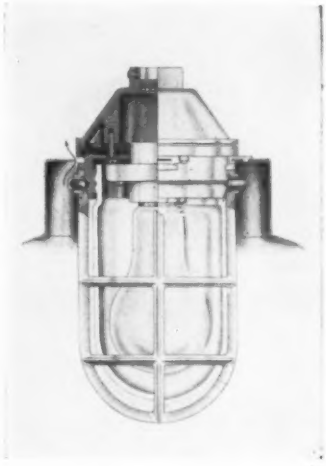
This Code Cover has been field tested and is adaptable for gang cover and sectional switch boxes.

Write P-629 on reply card, pg. 17

Vaportite lighting fixtures

A NEW, COMPLETE line of Vaportite industrial lighting fixtures with or without porcelain reflectors has just been announced by Steber Manufacturing Co., 2700 Roosevelt Rd., Broadview, Ill.

The units feature all aluminum die cast bodies and guards, engineered to permit relamping and cleaning without the aid of tools. They are available in 100 or 200 watt types for pendent, wall or ceiling mounting.



Wall and ceiling units are attached to outlet box cover or to cast aluminum box having four ½-inch or ¾-inch tapped hubs. A fifth hub in back can also be tapped if specified.

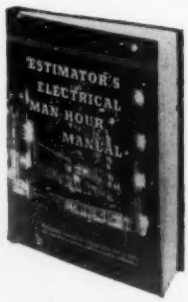
All white, ventilated porcelain enameled reflectors are equipped with self-locking nylon shoes for attaching or removing by 45 degree turn.

Write P-630 on reply card, pg. 17

VFS modular switchboard

THE VFS DISTRIBUTION switchboard, a new modular switchboard that will meet all operating requirements up through 5,000 amperes with quick-make, quick-break switch action, has been introduced by Federal Pacific Electric Co., 50 Paris St., Newark 1, N. J.

Using QMQB switches for applications up to 1,200 amperes and SP-1 service protectors for applications up



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through 5,000 amperes, the VFS switchboards are designed especially for use in medium and large commercial, institutional, and industrial buildings where service needs range from 600 through 5,000 amperes, 250 and 600 volts. The switchboards will handle not only heavy continuous currents but will also give fault protection on short circuits up to 200,000 amperes.

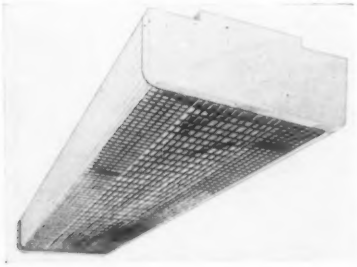
Built-in flexibility is achieved through the switchboard's modular design. Switches can be added, replaced or interchanged in a matter of minutes. Also, inspection under operating conditions has been made easy. Front removal, for example, can be achieved without disturbing either the bus or the adjacent units.

Write P-631 on reply card, pg. 17

Wrap-around diffuser

A SHALLOW, modern fluorescent fixture that offers quality construction and economy is now being made by Metalcraft Products Co., Inc., 6225 State Rd., Philadelphia 35, Pa. The Hi-Lo one-piece diffuser combines a high intensity, clear prismatic bottom with soft, white, low brightness sides to give a modern two-tone color effect. It gives increased down lighting and glare-free, low surface brightness as it emits light from sides, bottom, and top.

The entire fixture is only 3⅝ inches deep, including the diffuser. The one-piece wrap-around plastic shielding lowers from either side for easy lamp maintenance. Fon continuous runs, the end plates are removed so that the plastic to plastic run provides an unbroken stream of comfortably diffused light. The end plates have continuous spring-loaded hinges that hold the end plate open during installation or removal of the plastic diffuser.



When pendant mounted, the wrap-around diffuser provides a dustproof encasement that permits uplighting through the plastic as well as emitting light through the sides and bottom. Soft, modified lighting is given off when surface mounted.

Write P-632 on reply card, pg. 17

BullDog 3-wire Electrostrip

New 3-Wire Electrostrip, providing electrical outlets anywhere along its length, is designed by BullDog Electric Products Div., I-T-E Circuit Breaker Co., Detroit, Mich., to meet Code requirements for equipment grounding. Manufactured especially for use with appliance and office machines, it contains provisions for equipment grounding. Three-wire Electrostrip will also accept both two and three prong plugs.

Electrostrip, a flexible multiple outlet assembly made of new extruded polyvinyl chloride, is rated 20 amperes, 125 volts a-c and is listed by Underwriter's Laboratories.

Electrostrip mounts easily on any surface and so designed to enable the user to locate and re-locate receptacles anywhere desired. It eliminates the necessity for long dangerous extension cords and costly re-wiring jobs.

Write P-633 on reply card, pg. 17

Buss Low-Peak fuses

Buss Low-Peak fuses are reported capable of safely interrupting fault currents up to 200,000 amperes, limiting let-thru current to exceptionally

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low values and holding 500 percent load for minimum of ten seconds.

Circuits can be fused close to their normal current load and motor-starting currents or other harmless overloads will not cause the fuse to blow. Yet, on heavy fault currents, the fuse opens so rapidly the fault current cannot build up to a damaging peak. Let-thru current is restricted to safe values, protecting circuit components against thermal and mechanical stresses.

According to the manufacturer, the tremendous increase in the use of electrical power and the corresponding increase in available fault current has created the need for a fuse with these characteristics.

Write P-634 on reply card, pg. 17

Emerson-Pryne recessed lights

The time required to install recessed fixtures for both new construction and remodeling can be reduced by over 50 percent with three new Emerson-Pryne snap fixtures that need no screws, nuts or bolts for assembly or installation. The fixtures are made by the Emerson Electric Mfg. Co., St. Louis, Mo.

All components of the new snap fixture are designed to snap into place quickly and easily. For new construction, mounting straps snap onto the frame and are nailed between the joists. No framing is needed. For remodeling jobs, the fixture simply snaps into the plaster board. No screws or bolts are required. Tools are used only to cut the ceiling hole.

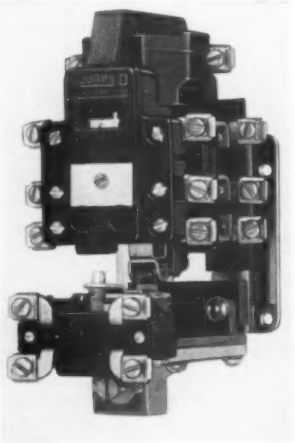
Other time-saving features of the new Emerson-Pryne snap light includes: Faster connecting of wires because they can be worked out in the open where they are easily accessible; snap-in junction box that is snapped closed and then snaps into the mounting; aluminum reflectors that snap easily into position ready for immediate use, or upside down to prevent paint or plaster from splattering on the surface during construction.

Write P-635 on reply card, pg. 17

Combination relay-timer

A NEW DEVICE which combines the functions of a machine tool relay with a time-delay relay has been announced by Square D Co., 4041 North Richards St., Milwaukee 12, Wis. The new relay, which has mounting dimensions identical to all Square D Type D relays and Type A timers, reduces the panel mounting space and installation time which would be required by separate devices.

The timer head provides either time delay after energization or time delay after de-energization, and is



convertible in the field from one to the other. Timing range is from 0.2 second to 1 minute, plus or minus 15 per cent.

The new relay is available with 2 N.O. and 2N.C., or 4 N.O. and 2 N.C. instantaneous contacts, plus 1 N.O. and 1 N.C. timed contacts. Relay contacts are rated at 10 amperes. Pressure wire connectors are supplied on all terminals. The single molded coil resists moisture, dust, and physical damage.

Write P-636 on reply card, pg. 17

Luxtrol light controllers

Light controls to dim, brighten or blend home lighting now are made in four sizes by The Superior Electric Co., Bristol, Conn. The smallest and newest Luxtrol light control dims up to 200 watts of incandescent light. Others handle up to 450, 800 or 1800 watts.

All fit into standard four-inch walls and take the place of ordinary on-off switches. Any degree of illumination from off to full brightness can be ob-

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OPEN-TOP WIRING — ready for immediate wiring — speedy and easy installation without removal of the interior mechanism. DUST-PROOF (Completely enclosed) INTERIORS with extra large binding head screws that are backed out and staked. Replaceable interior gives absolute satisfaction on full rated loads with performance that far exceeds Underwriters' Standards. Porcelain Receptacles No. 1736 and 1924 are pull-chain, three piece with shadeholder groove. For 3¼" or 4" box.
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tained by turning a dial.

Luxtrol light controls are installed as easily as an on-off switch. The 200 watt unit takes about the same space as a double on-off switch. Larger units take more space. Wall plates fit closely to the wall and are available in brushed brass, stainless steel or prime painted. Knobs are black, grey or ivory.

The mechanism of Luxtrol light control is an auto-transformer which adjusts light to any level smoothly and steplessly. It consumes only the current needed for illumination, thus saving electricity. It does not create heat.

Write P-637 on reply card, pg. 17

I-T-E's new 4 kv switchgear

A completely new design of 4,160-volt circuit breakers and switchgear has been announced by the switchgear division of I-T-E Circuit Breaker Co., Philadelphia.

The breakers—first to combine stored-energy closing and ironless blowout in this voltage rating of the I-T-E line afford fast fault interruptions, fast closing of contacts, and smaller size.

The result of the re-design is a major advance in terms of greatly improved fault protection, increased safety for personnel and equipment, higher reliability, easier handling and much simpler installation, maintenance and service.

The types of switchgear construction available include the conventional indoor arrangement, and two types of outdoor configurations—standard enclosed and full walk-in.

New design breaker contacts are made virtually maintenance-free, with arcing contact surfaces of high refractory silver alloy—for minimum deterioration under arcing. Main contacts are a silver alloy which provides excellent electrical conductivity. All contacts afford abundant wiping action to insure proper contact.

Write P-638 on reply card, pg. 17

Blackhawk fittings display

Blackhawk Industries, Dubuque, Iowa, has announced that the company's new fittings display board is now available to their wholesale customers.

This 18 inch by 24 inch counter

board was designed to display Blackhawk electrical fittings. It permits contractors to thoroughly inspect each item. Identification of each fitting by catalog number makes it easier for the contractor to complete his order.

Write P-639 on reply card, pg. 17

Wheatland hot-dipped conduit

Wheatland Electric Products Co., Pittsburgh, Pa., has announced the availability of its new hot-dipped galvanized rigid steel heavy wall conduit, which is being produced in standard trade sizes ½-inch through 6-inch with zinc-protected threads, Plastic thread protectors are color coded for size identification.

Galvanized couplings, standard and large radius elbows are also available in the full range of trade sizes.

Write P-640 on reply card, pg. 17

"SNAPER" STRAPS
Trade Mark Reg.
FOR THIN WALL & RIGID CONDUIT

THE SNAPPER
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THE STANDARD
THE ORIGINAL
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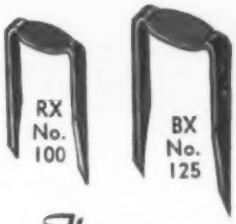

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Helpful literature

available to our readers

"Opal Drum Lights," a brochure released by the **Prescolite Mfg. Corp.**, 2229 Fourth St., Berkeley, Calif., describes in detail round and square **opal drum lights** in the Prescolite line. Hand blown Thermopal glass is hinged to a "Dielux" diecast aluminum pan. Round drum lights may be installed on either ceilings or walls. Square drum lights feature easy relamping.

Write B-641 on reply card, pg. 17

A 300 page catalogue describing heavy duty electrical **transmission and distribution equipment** for commercial, industrial, residential, and governmental installations is now available from **Continental Electric Equipment Co.**, 205 W. 4th St., Cincinnati, Ohio. Detailed specifications and prices are listed for every piece of equipment available from the company in 1960.

Write B-642 on reply card, pg. 17

SMD (solid-material, dropout) **fuses** for 34.5- to 138-kv power transformer primaries, station service auxiliary transformers, potential transformers and sectionalizing are described in a new issue of Bulletin 261 produced by **S&C Electric Co.**, 4435 N. Ravenswood Ave., Chicago 40, Ill. The bulletin discusses fuse application principles and short circuit interrupting ratings.

Write B-643 on reply card, pg. 17

All portable Floralites and Florafloods, made by **Steber Mfg. Co.**, Broadview, Ill., are now equipped with three-conductor cord sets and adapters to comply with new National Electrical Code requirements. This important improvement in construction and several new Floralites are illustrated and described in Steber's New **Garden Lighting** Bulletin No. 135-60 which is now available. Also included are cast aluminum components for a complete underground wiring system for garden, landscape and play area lighting.

Write B-644 on reply card, pg. 17

Bulletin GEA-3592L, 32 pages available from **General Electric Co.**, Schenectady, N. Y., gives detailed information on the features, operation and application of the new selectively-coordinated **load center unit substations** that provide continuous power for a-c distribution systems, 300 to 3000 kva, 600 volts and below. The bulletin discusses and compares types of load center arrangements and explains how selective coordination of load centers can be provided on any of the four basic industrial and commercial building power distribution circuits.

Write B-645 on reply card, pg. 17

Technical data and test information on all-aluminum heavy duty **multi-bolt fittings** is contained in Data Folder #6003 For The Electrical Power and Light Industry, published by **Jasper Blackburn Corp.**, St. Louis 14, Mo.

Write B-646 on reply card, pg. 17

Application data (No. 30-660) for plug-in, low-impedance, **high-frequency** and electric-utility **bus duct** is contained in a new 12-page booklet available from the **Westinghouse Electric Corp.**, Pittsburgh, Pa. The general information, descriptions and drawings in the publication illustrate a variety of applications for these four types of bus duct.

Write B-647 on reply card, pg. 17

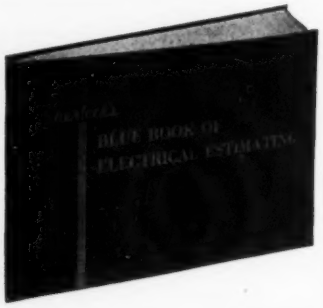
Complete descriptions of all **two-way mobile radio** base station equipment available from **Motorola, Inc.**, Chicago, Ill., are contained in a new booklet published by the company. The new catalog contains specifications and photographs of upright cabinets, remote control and desk top consoles and special a-c utility base stations. In addition, several pages are devoted to descriptions of the various base station antennas, monitor receivers and Motorola's "Quik Call" selective signalling system.

Write B-648 on reply card, pg. 17

A booklet providing estimated **costs for electric heat** in 105 major cities and marketing areas, and an analysis of installation procedures has been announced by **Sun-Tron Corp.**, Chicago, maker of electric heating equipment. Separate booklets are available for the 105 areas, broken down by design temperatures. Included is an installation cost worksheet for the electrical contractor, an outline showing where heaters should be placed for greatest efficiency, and specifications of Sun-Tron heaters.

Write B-649 on reply card, pg. 17

A comprehensive workbook to aid in planning **articulated unit substations** for secondary distribution has recently been released by **Pennsylvania Transformer Div.**, McGraw-Edison Co., Canonsburg, Pennsylvania. Ratings, weights and dimensions are included in the workbook for efficient planning of low-voltage substations for secondary distribu-



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(June 1960)

tion systems. Types of load centers and substations are described for both indoor and outdoor applications.
Write B-650 on reply card, pg. 17

A new 8-page color catalog by **Moldcast Manufacturing Co.,** Newark, N. J., describes the company's complete line of aircraft quality cast aluminum **outdoor lighting fixtures.** The catalog features five original and modern shapes in outdoor lighting, including such features as compatibility designed enclosed louvres and lenses for each fixture, and gasket sealed weatherproof wiring boxes.
Write B-651 on reply card, pg. 17

Code discussion

(Continued from page 122)

circuit panelboard shall be protected by overcurrent devices not greater than the panelboard if the panelboard is supplied by conductors which are protected by overcurrent devices greater than 200 amperes.

A lighting and appliance branch circuit panelboard "is one having more than 10 per cent of its overcurrent devices rated at 30 amperes or less, for which neutral connections are provided." Section 384-15 states, "Not more than 42 overcurrent devices of a lighting and appliance branch circuit panelboard shall be installed in any one cabinet or cutout box."

Prefabricated buildings are required by Article 390 to be wired by the same Code rules as any other building with no exceptions.

In the next issue, we will begin Chapter 4 of the Code.

Answers to Code test questions: (1. **T** Section 370-18-a-1) (2. **T** Section 370-18-a-2) (3. **F** Section 370-23) (4. **T** Section 380-5) (5. **F** Section 380-7) (6. **a** Section 380-13) (7. **b** Section 380-14-c) (8. **a** Section 380-16) (9. **c** Section 384-14) (10. **c** Section 384-26)

Know the law

(Continued from page 116)

mony was that the manner in which defendant delivered current to plaintiff's wires was reasonably safe so long as there was no defect in plaintiffs' wires or facilities. As we have indicated, defendant had no duty to discover that defect or to protect plaintiffs from it.

"We consider the cited case of Consolidated School Dist. v. West Missouri Power Co., 329 Mo. 690, 46 S.W. 2d 174, as inapplicable. In that case, liability was predicated upon evidence that defendant power company had permitted two transformers to become defective, thus permitting a greater voltage of electricity than was reasonably safe to be discharged into plaintiffs' wires, which condition caused a fire that destroyed plaintiff's school building. That is an entirely different situation from that involved here, where excess current was drawn from the transformer solely because of a short circuit in the wires of plaintiffs' house."

Conductor heat

(Continued from page 84)

From equation (3)

$$I = \sqrt{\frac{2.279 \times 0.51}{0.1743 \times 1.578 \times 10^{-5}}}$$

$= \sqrt{422258} = 650$ amp. (See Fig 4)

$I = 650 \times 0.9886 = 642$ amp for hard drawn copper.

The unit heat dissipation values plotted in Figures 2 and 3 and the current carrying capacities plotted in Figure 4, represent results derived on a basis of free and unimpeded natural air currents; and that the surrounding air and walls have the same temperature. This assumption should be kept in mind and the probability of deviation therefrom investigated in connection with engineering applications.

A temperature gradient is necessary for the flow of heat just as a potential gradient is necessary for the flow of current. If a conductor carrying current and the surrounding air remain at the same temperature there can be no heat transfer by convection. On the other hand, if the walls and surrounding air are of the same temperature as the conductor and in close proximity thereto there can be no heat transfer by radiation. This condition could exist where a conductor is exposed to direct radiation from hotter surfaces, such as boiler walls, furnaces, etc.

25 kv feeders

(Continued from page 81)

services over 100 amperes in the network area.

The air conditioning rule is the result of the development of a high power factor single-phase motor with better starting and

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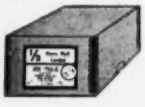

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running power factor, so that it is feasible to use the larger size on residential secondaries. Also, we can be more positive in the design of our residential secondaries when we know that we won't have one or two three-phase jobs in every block.

The Sears Building was the first to qualify for 277/480 volt service in the network. We required their engineers to give us a cost comparison of the two methods of wiring, that is 277/480 vs 120/208. Their cost data indicated a savings of $100,000 for the 277/480 volt system. In these cases, we require the customer to supply the vault, ventilation for same, and all the conduits to the street manhole. The utilities supply the primary cables, transformers and protectors, so that a spot network is formed.

The Coliseum became the first to qualify for 277/480 in the overhead area. This voltage was almost a necessity for that installation, on account of the long cable runs.

Our 120/208 volt network is continuing to grow, and proper service equipment, having the necessary fault capability, has become a matter of increasing importance. The introduction by Westinghouse of a reasonably priced 75,000 ampere interrupting capacity circuit breaker, rated up to 800 amperes carrying capacity, enabled us to revise our rules to require this protection on all new services over 100 amperes. Up to 100 amperes, however, a Class A switch, with Fusetron or other high interrupting capacity fuses, is acceptable.

Street lighting

(Continued from page 79)

controlling the system.

A total of 495 20,500-lumen color-corrected lamps replaced 185 6,000-lumen and 310 10,000-lumen lamps.

By utilizing the existing poles and luminaires, the conversion of the 495 units to mercury vapor cost approximately $70,000. Of this amount, 14.3 per cent was maintenance. This was an average of $141 per pole. It was estimated that the cost of installing a completely new mercury vapor system on 30-foot poles with standard luminaires would have cost approximately $202,000 or $408 per pole. A total savings of $132,000 was realized on this job by utilizing existing equipment.

The City of Birmingham was formerly receiving 179 and 241 lumens per dollar for the 6,000 and 10,000 lumen lamps, and with the converted system they are now receiving 292 lumens per dollar.

It is realized that this is not the most efficient system for street lighting; however, the light that is not directed on the traveled portions of the street is not lost for this area is highly developed and the color-corrected lamps provide spill light to illuminate the sidewalks and the building fronts.

Tool hanger

(Continued from page 78)

developed a jig to shape the hangers, and he turned out 1,500 of them in less than two weeks. The hanger consists of a strip of 1/8-inch strap iron, 5/8-inch wide and about 9 inches long, bent into a C-shape, the top curve of which is 1-1/16 inches in diameter, and the bottom curve 5/8-inch diameter. A 1/2-inch strip of spring steel is double-riveted to the inside bottom curve of the hanger so that the open side of the hanger is closed, with the spring not quite touching the top of the opening so that it can move inwards or outwards. The hanger is then mounted in the desired position on a wood or fiberglass stick with a stainless steel band having a screw tightener.

When the tool is hung on a conductor, the spring steel returns to fill the open side of the hanger. To remove the stick, it is lifted until the spring is opposite the conductor, and enough side pull exerted to move the spring, freeing the tool. Repeated tests have failed to dislodge a tool accidentally, either from large or small conductors. We kept cost records on the production of the tool hanger, and they cost us about 30¢ each.

Mobile substation

(Continued from page 77)

To change from one low voltage connection to another requires only that the strap connectors on the terminal board be arranged in accordance with the terminal board nameplate diagram. The 480Y/277 volt connection is obtained by changing connections inside the transformers on H. V. terminal boards.

The low voltage cables to the load, in all cases, are connected to X1, X2, X3, and when applicable X0, terminals extending be-

low and behind the terminal board. Arkansas Power & Light has very little 2,400 volt or 4,160 volt distribution; therefore, the design of the mobile substation transformers was not complicated by specifying operation from 2,400 or 4,160 volts.

This mobile substation is to be used for both emergency operation and routine maintenance of commercial and industrial transformer banks including several 500 kva three-phase vault type transformers serving radial secondaries at 208Y/120 volts.

If emergency and maintenance usage of this substation develops as expected, additional units will be constructed with possible modifications which may be indicated by more experience with the unit.

Pole treatment

(Continued from page 74)

structed prior to 1945. Poles treated in 1957 and 1958 will be spot checked in 1962 and 1963. If decay is being controlled a complete inspection will be made in 1965 and 1966. The results of this inspection will determine the length of time between future inspections of treated poles.

Consideration had been given to eventually making the first inspection after fifteen years of service. The results of the inspection made on poles set in 1946 seem to indicate the first inspection may be delayed to 18 to 20 years.

Future treatment

To date all standing transmission poles that have been treated at the ground line have been treated with a combination of toxic salts in a coal tar and creosote vehicle. The successful penetration of the salts into the wood depends on moisture in the pole. Plans are now being made to use a pentachlorophenol loaded grease for ground line treatment in an area where average annual rainfall is 18 inches, the thought being that if the moisture content in the ground line area of the pole drops radically in low annual rainfall sections of the territory, the toxic salts presently used for treatment may not penetrate the wood. Poles in this line section will be treated with both methods and an attempt will be made to evaluate the effectiveness of each.

The initial treatment of poles with heart rot was the same as that used for outer decay. The effectiveness of this treatment depended upon the ability of the toxic salts to penetrate a shell of sound wood three or four inches thick. Such penetration, while possible, left a reasonable doubt in the minds of our engineers; therefore, in 1959 a few poles with hollow heart decay were treated in the following manner: the extent of cavity was determined by several borings into the center of the pole; a nozzle attached to a small portable pump was driven into the uppermost boring; and the cavity filled with water soluble toxic salts. This method of treating heart rot seemed feasible, and while somewhat more expensive than the previous ground line treatment, it was decided that if poles were to be left in the line with heart rot this treatment would be used.

Economics of pole treating

The economics of a ground line treatment program have been avoided in this paper. It is our opinion that if the 365 poles rejected and replaced during 1958-

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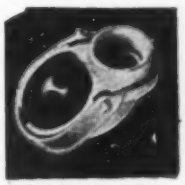

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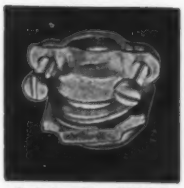

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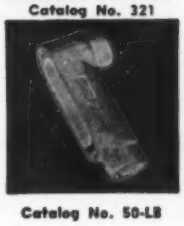

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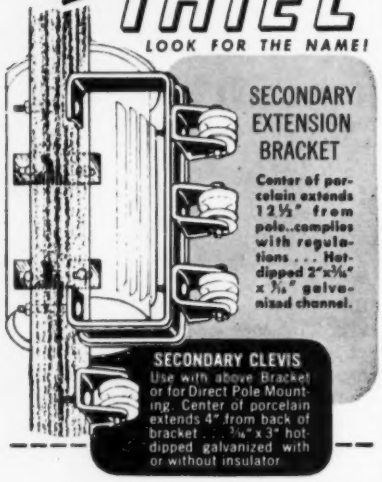
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1959 could have been treated in time to avoid replacement for eight to ten years, this factor alone would pay for the inspection and treatment of a large number of poles. If ground line treatment is effective, the 522 poles found with decay during 1958-1959 should not require replacement for many years.

An attempt was made to evaluate decay patterns in areas of different soil and varied annual rainfall. From the accompanying charts, it is apparent that no regular pattern exists on the system. The high percentage of poles replaced after approximately thirty years in some line sections was alarming.

Conclusions

Pole inspection to determine the extent of decay and need of replacement is necessary. Perhaps excavating and inspecting the pole is not the only answer. Chemical analysis of preservative left in the pole may be a solution; however, training will be required if company personnel are to be used to evaluate pole life by this method. Mechanical testing by stressing the pole and measuring the strain in the wood fibers is of value in many instances; however, in the case of H-frame structures with X-braces and structures carrying more than one circuit, the procedure becomes complicated for the average line foreman. Therefore, it is our opinion that if a pole is to be inspected to determine ground line decay, it is necessary to excavate around the pole; and some type of ground line treatment is necessary prior to backfilling the pole.

Mapping program

(Continued from page 71)

drafting was started on the final maps.

Procedures were established for keeping the maps up to date after completion, and this slowed to some extent the work on the new maps. However, some twenty-two months after the program was started, the final distribution maps were completed. After completion of the distribution maps, small scale one-line maps of the entire system were prepared for wall mounting, and we have recently completed maps of the series street lighting system.

Preparation of the maps has been a tedious and costly job, and the question might arise as to whether the use justifies the expense. The answer, insofar as the Knoxville system is concerned, is that there seems to be an almost endless variety of uses for the maps with new applications continually being devised. One of the most important applications is in distribution load studies, system planning, load balancing, etc. Also, photographic reductions of the maps in book form have been placed on all construction and operations vehicles, excerpts of the maps have been prepared for assigning work areas to tree crews, plastic overlays with coordinate lines have been made for the book maps for dispatching trouble crews by grid coordinates during the Civil Defense Conelrad alerts, and a large wall map consisting of both full scale and photo-reductions of the grid maps is now under construction for use by the system load dispatcher.

Records slow loss

(Continued from page 53)

either as a whole or as applied to any specific job.

Assuming that a specific job failed to show a normal net profit; we check through the actual materials used and the actual amount received for them, to ascertain whether or not the profit leak was in materials.

If not, we check the labor record. If we find that labor cost us more than we had figured in bidding the job, we try to find out why. Knowing that the leak was in the labor end of the job, we then can analyze what we did

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See Page 17

throughout the job and determine the cause of the leak. Knowing where it was, we are in a much better position to avoid it in the future.

We find that the customer also likes to have his statement broken down to cover labor and materials separately. If he wishes to check, it is easy for him to check on the materials, since they are listed apart from labor.

IES conference

(Continued from page 43)

Russian lighting has 125/250 volt, 3-phase wiring in the larger cities, which is more universal than in other European countries. Most European countries follow no consistency in the matter of wiring, using any of various types.

Pictures of modern illumination in Brussels against a background of ancient buildings were shown the IES members. Most of the downtown street lighting provided good illumination with 200 to 400 watt lamps. Lamps in the residential areas, however, were usually about 40 watts.

He also commented on the British system of roadway lighting which provides good illumination but has a great deal more glare than similar lighting in America. He is of the opinion that the future will see low-mounted direct lighting for roadways in this country and pointed to the many experiments now being carried out in this field.

W. E. Folsom, Commercial Sales Manager for Dallas Power and Light, told IES members of new innovations in the "Lighting of Downtown Stores," and said the illumination engineer is fortunate who has an interior decorator to work with him in selecting proper fixtures and illumination for new stores.

Folsom said that with the new color sources now available, the industry will see more use of color in the lighting of new buildings. He also used colored pictures to show a variety of new buildings with luminous walls and ceilings now being used to highlight merchandise.

Following on the program was Carl Allen, products planner with General Electric Company, Cleveland, Ohio. Allen demonstrated the "Latest in Light Sources," and introduced a new line of quartzline lamps that he said are the latest development in compact light sources. He showed a 1,500-watt quartzline lamp small enough to fit in a person's pocket.

Allen also demonstrated a number of colored panels. The thin panels contain a chemical between two plastic or glass plates with electro-luminescence properties in the chemical that does away with the need for wires and makes possible a change in colors. As soon as economically feasible, Allen believes that many homes will have such glass walls, permitting the color scheme to be changed at will. At present it costs about $200 per square inch to install!

IES applied lighting competition awards were made to winners of the two classifications. First place winner in Class I, residential lighting, was Roy Jackson, Central Oklahoma Chapter. Second place; Virginia Benson, Coastal Bend Chapter; and third place, Jan Davis, North Texas Chapter.

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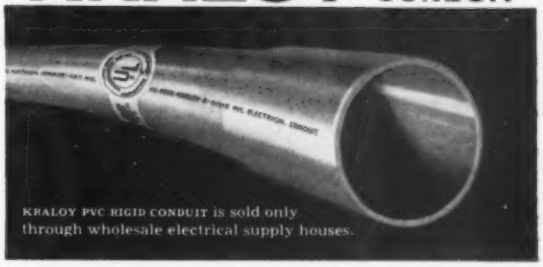

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In Class II competition, the commercial and industrial division, first place winner was Dan Weiser, San Jacinto section; second place, Tom Moore, North Texas Chapter; and third, Patrick Dunlop, Central Oklahoma Chapter.

Rewiring activity

(Continued from page 41)

painted the same color as the existing walls.

In some of the buildings we rewired, there were no individual conduits to each apartment. This meant installing conduits large enough to control entire floors of apartments. These were usually run in stairways if possible, or in incinerator rooms if available, or in public hall if necessary. We would terminate in circuit breaker panels adequate for the entire floor, running the feeders to the apartments in existing conduits or in surface raceways on the surface of the public halls along the baseboards and trim, terminating in each apartment as we reached it.

Only as a last resort would we install conduits on the outside walls of the buildings and this in cases where the physical properties of the building made it impossible to run otherwise.

Results of project

The results of our installation were not only that we provided for two or three air conditioning units per apartment, but that in the process we improved the entire wiring system of the buildings, most of which had become inadequate and many of which were fire hazards.

After rewiring some 25 such buildings, we have come to the conclusion that considering the relatively low cost of rewiring the electrical systems as against the innumerable improvements resulting, it is definitely to the benefit of the building owners to plan such installations.

MS1-14

Washington report

(Continued from page 8)

Economic logic is not always political logic. The political appeal of high tax rates on the well to do and on corporations for a long time has been so great that no sensible politician would oppose these high tax rates.

Now a politician has. He is Richard Nixon, Vice-President of the United States, almost certainly the Republican candidate for President, and possibly the next President of the United States.

Not even Nixon's severest critics would accuse him of not being a practical politician. In fact Nixon's critics say that he is too opportunistic, perhaps the shrewdest operator in the business, always a bit ahead of the field.

So when Nixon comes out for tax reform it may be of more than passing significance.

The proponents say "Tax Reform," not "Tax Cut." They argue that there will only be a temporary tax revenue loss from reducing rates on corporations and individuals. For the money saved will be invested; the investments will create more income; and tax revenues therefore will quickly rebound.

Speaking at Hot Springs, Va., last month Nixon told a group of economists that some reduction of high bracket income tax rates might be possible next year.

Tax measures definitely should not be debated in the political heat of an election year, Nixon said. The whole question will depend on the international situation.

"If we have met adequately our responsibilities for national security, and have a substantial budget surplus, a new Congress should be able to consider, in a temperate and responsible way, a tax reform measure."

Another surplus of about $4 billion in the budget, like that in prospect for the fiscal year starting July 1, would let Congress start work on a tax bill, Nixon said.

Nixon said that any tax bill should be aimed at stimulating business incentives, productive investment, and economic growth.

You will be hearing more about income tax reductions in the future. If passed, a tax reduction bill might help you build your business. It might help America grow.

Economic comment

(Continued from page 6)

come), more public works, and the like. Along with such goals will be a determined push for deficit spending. All of this will be opposed vigorously by the Republicans on the ground that such is unnecessary and would tend to weaken the framework of present prosperous conditions.

In addition to these items, there will be other problems that are too extensive to be discussed in this column. Medical care for the aged, extension of social security benefits, the farm problem, and several others are a few of the items that may cause serious arguments between the candidates.

While the political pot boils, there will probably be the normal tendency to keep economic activity on an even keel until the November results are tabulated. This may explain in part the unusual situation on the stock market today.

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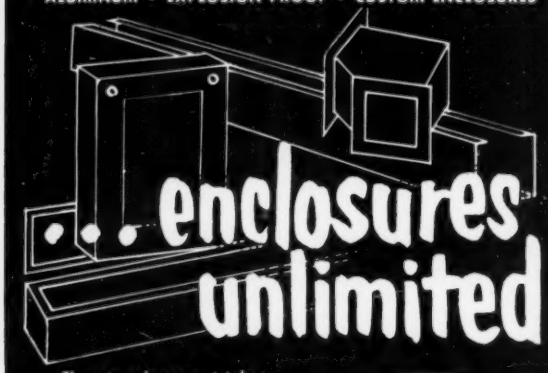

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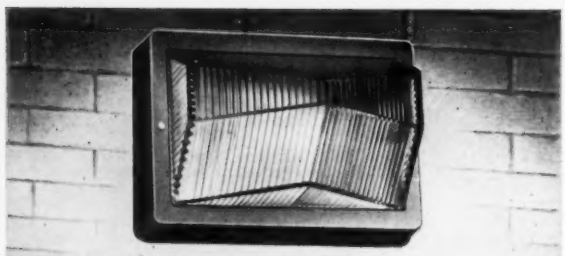

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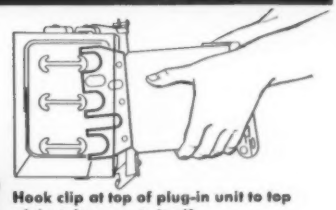
White-Rodgers Company 134

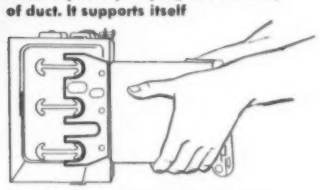
Why SQUARE D ALUMINUM PLUG-IN DUCT?

Because you want a duct that's rugged – built to thrive on heavy duty – *plus*

PLUG-IN UNITS GIVE YOU EXCLUSIVE *hook-swing* MOUNTING



Hook clip at top of plug-in unit to top of duct. It supports itself



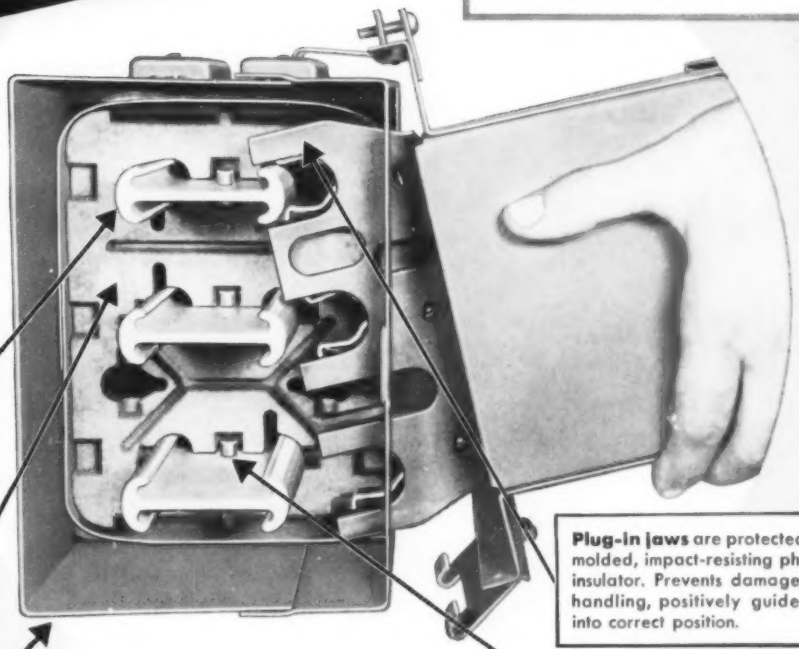
Then, just swing plug-in unit down until jaws engage bus bars

Hanger mounting (*not shown*) makes installation easy. A universal hanger permits mounting in *any* position. Just suspend and level top portion of hanger, then clip on lower portion. U.L. approved for 10-foot spacing.

I-beam construction of bus bars—a Square D exclusive—provides four times the strength of conventional bus bars. Bars are zinc, copper and silver-plated full length.

Full width bus support provides greater strength on short circuits, freedom from vibration. Also acts as fire stop where duct passes through walls and floors.

Square D duct is totally enclosed for maximum safety—no danger of accidental shorts. Prevents overheating from dust accumulation.



Plug-in jaws are protected by a molded, impact-resisting phenolic insulator. Prevents damage from handling, positively guides unit into correct position.

Steel pins in each bus bar prevent bars from shifting and support them on vertical riser installations.

With other plug-in duct, it's no easy job to mount the plug-in units. In fact, it takes a lot of real pushing which is neither safe nor easy when you're working on a ladder. With Square D's exclusive *hook-swing* mounting, you just hook the plug-in unit to the top of the duct. Then, simply swing it down and in until the jaws have engaged the bus bars. No awkward pushing required—no unnecessary chances to take. Compare Square D's rugged, heavy-duty construction with any other. It costs no more—why settle for less?

Write for Bulletin SD-110. It gives the facts on Square D aluminum plug-in duct. Address Square D Company, Mercer Road, Lexington, Kentucky

SQUARE D COMPANY

wherever electricity is distributed and controlled

Owner and Electrical Contractor: Hatfield Electric Co.
Cleveland, Ohio
Architect: Dalton-Dalton Associates, Cleveland, Ohio.
General Contractor: Hunkin Conkey Construction Co., Cleveland, Ohio.
Albert M. Higley Co., Cleveland, Ohio

Mains and Distribution Panels — Protected by FUSETRON dual-element fuses.

HATFIELD Electric Co.,

a leading electrical contractor installs

FUSETRON dual-element fuses

in its new office building.

Mr. Brown, Vice-President tells why . . .

"For our own buildings and our recommendations to our industrial and commercial customers, we feel that FUSETRON fuses are the most reliable means of over-current protection that has been made available.

"We require protective devices for industrial and commercial application that not only provides adequate short-circuit protection but also protects against needless blows. In dead-front panel equipment it is especially desirable that they operate cool and efficiently. Of course FUSETRON fuses provide this.

"The additional protection features of these devices are of continual interest to our customers, and we feel their use is to our mutual benefit."

William L. Brown
V. P. Hatfield Electric Co.
Cleveland, Ohio

FUSETRON fuses are not mechanically operated devices, — so they remain SAFE no matter how many years they are in service. They have an interrupting rating of 100,000 amps. rms symmetrical—adequate for today's conditions and for anticipated growth in service demands.

For more information on Fusetron fuses, — write for bulletin FIS.

BUSSMANN MFG. DIVISION, *McGraw-Edison* Co., St. Louis 7, Mo.